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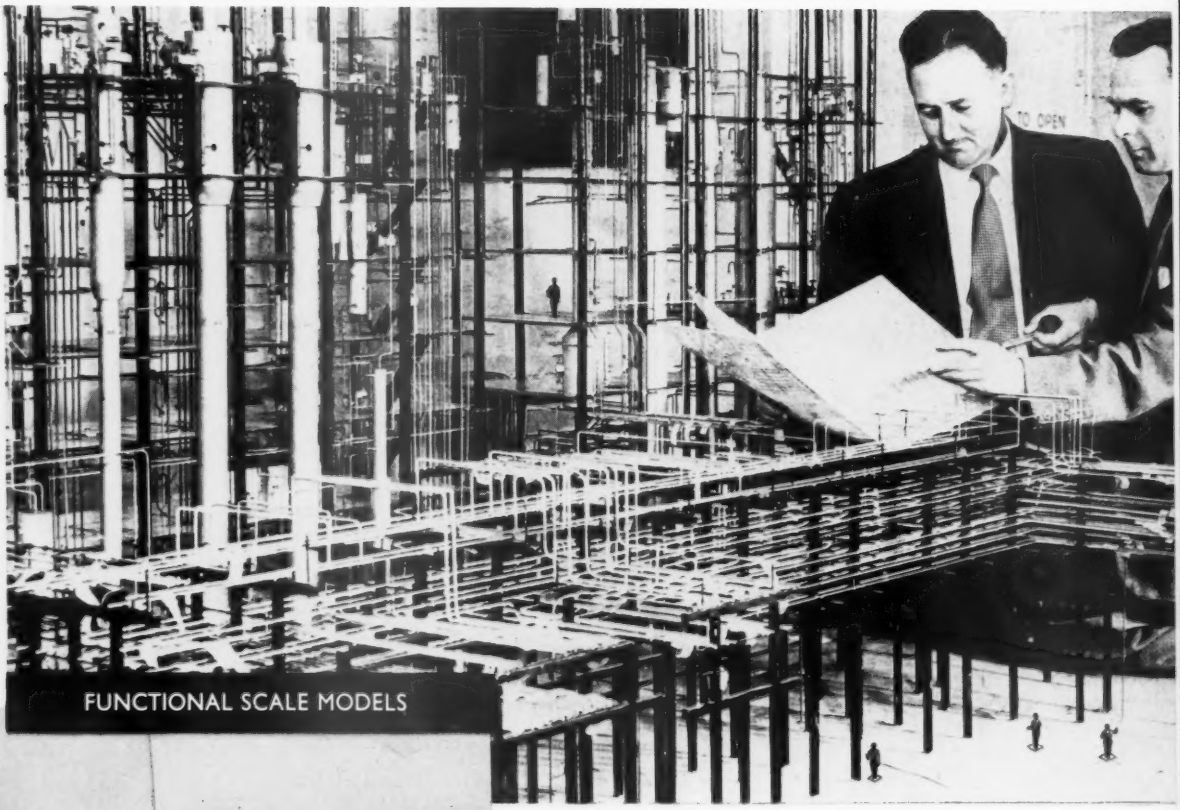

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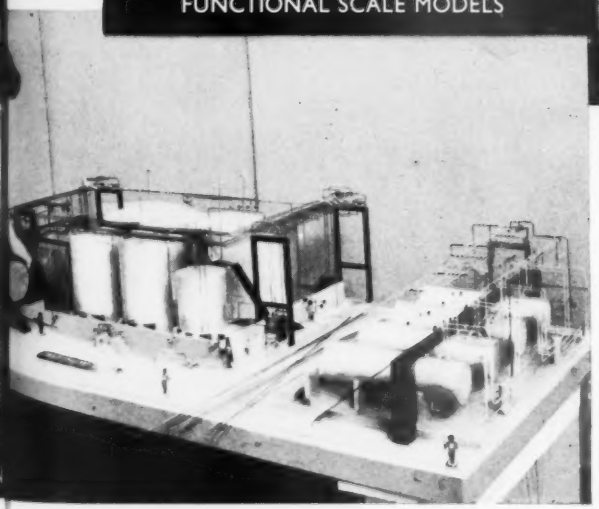

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	4	10	1¼	12	6 3/16	1/16	30¼
	6	12½	1 5/16	15½	8½	1/16	39½
	8	15	1½	16½	10¾	1/16	47½
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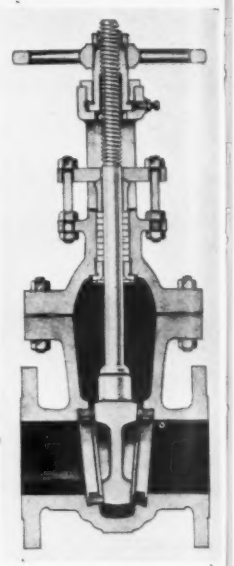

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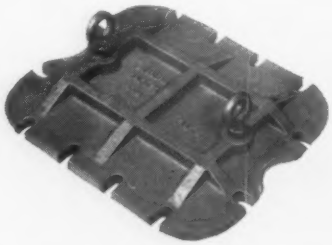

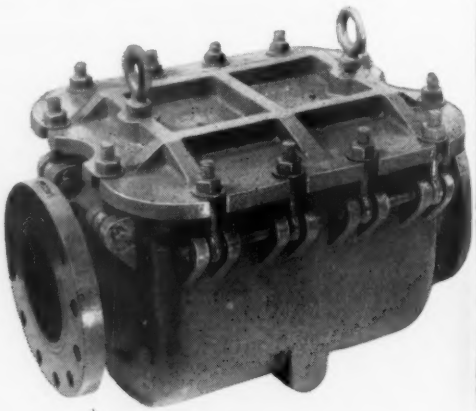

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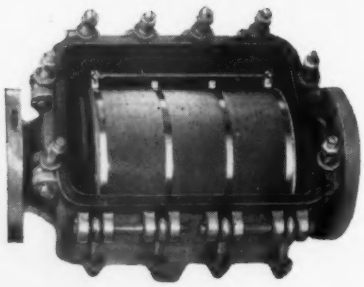

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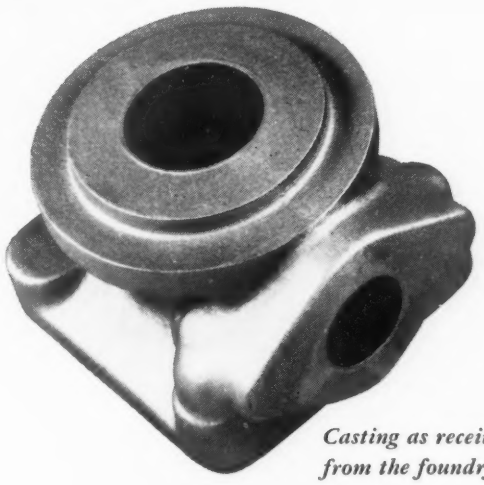

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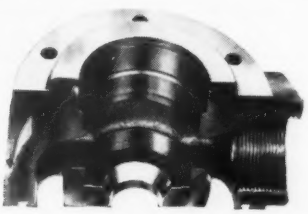

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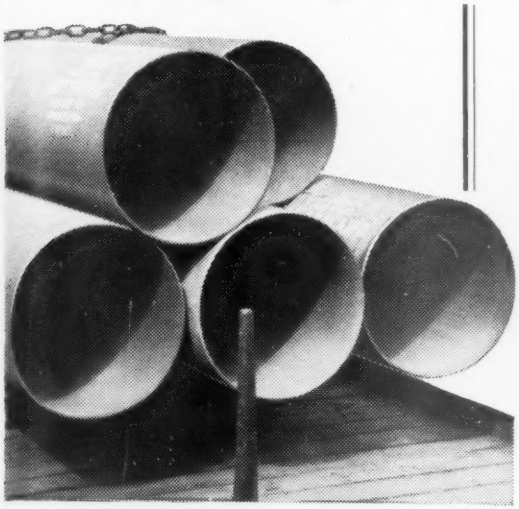

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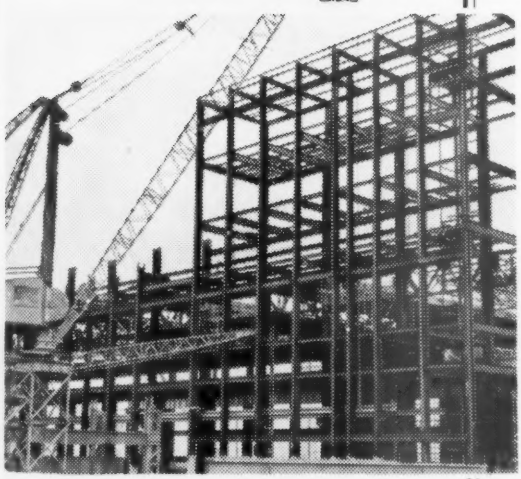

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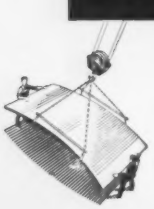

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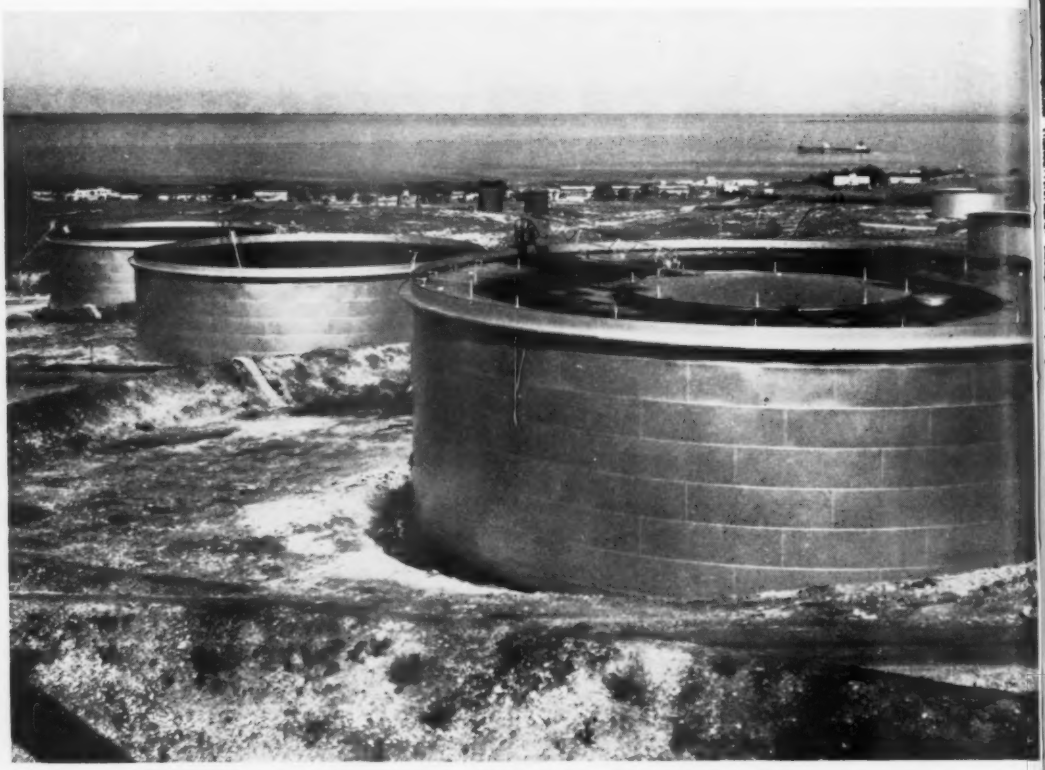

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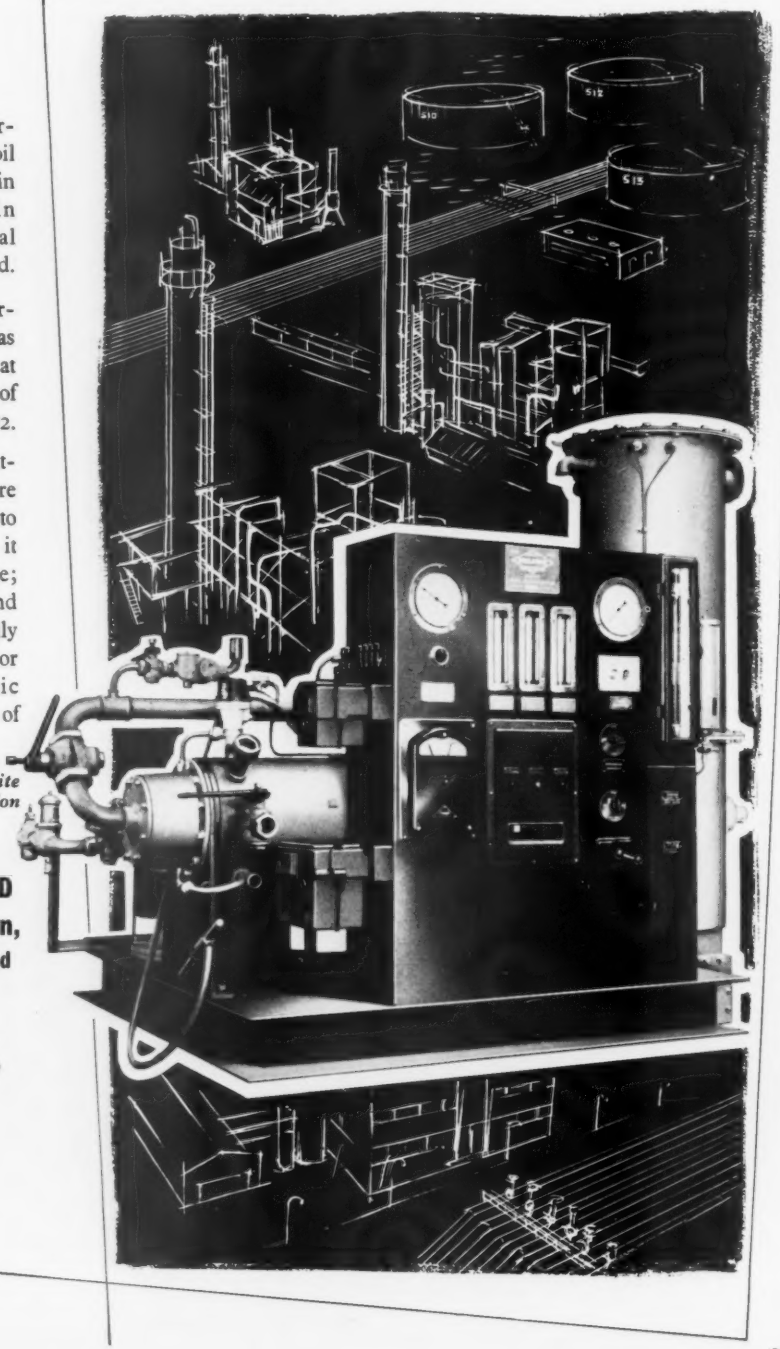

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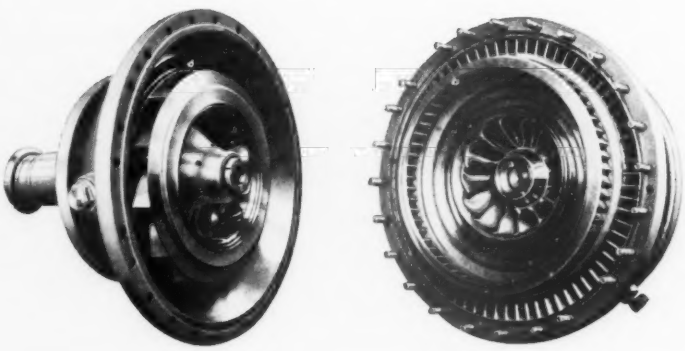

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*Control of Stock Losses**

By **A. C. McGECHAN† (Member)**

Introduction

The consumption of petroleum products in the United Kingdom in 1956 was 192 million barrels. In the operations of producing, transporting, refining, and marketing this oil it is estimated that something of the order of four million barrels was lost, equivalent to about thirty-five T2 tanker cargoes.

Losses of this magnitude must be fully understood and controlled. They form an important cost factor, but in addition to increasing operating costs, they reduce the availability of essential material and cause secondary effects of reduction in safety and product quality. Liquid losses can cause risks of fire and pollution of waters and drainage systems, while vapour losses can cause fire and explosion hazards. Loss of product quality can occur by contamination between grades of refined products or by evaporation from the lighter products when retained in storage.

There follows a brief description of the problems of oil loss in the functions of producing, transportation, refining, and marketing.

Producing

Losses from blowouts during drilling and completion operations and below ground losses during the operation of the well, by communication between reservoirs, or by inefficient depletion, have materially diminished due to improved methods and equipment. For wells delivering under high pressure, multi-stage gas trapping and control of separator pressures increases the oil/gas ratio and the ultimate yield of the well, and reduces the amount of sand produced and emulsification of water present in the oil. Cathodic protection has reduced leaks in pipelines to lease storage. Losses occur in storage tanks, but the oil does not remain in storage, subject to evaporation loss, for any length of time. The use of open sumps for separation of sand from oil is now usual only in fields producing heavy oil.

Producing operations are carried out at widespread locations by staff who are not under immediate supervision. Developments are taking place to make the transfer of the custody of the oil from the producer's lease to the pipeline fully automatic, without a representative of the producer or the pipeline operator being present. The volume of the oil corrected for temperature is measured from dump tanks, accurately calibrated between upper and lower weirs between the levels of which oil is delivered to the pipeline. Alternative to the method of measurement of volume by dump tank, temperature-compensated positive displacement meters are coming into use. A quality monitor keeps bad oil with excess of basic sediment and water out of the pipeline, diverting it to the treaters.

Transportation

Pipeline

Losses in transportation pipelines are caused by inaccurate measurements of the cargo at point of receipt or delivery, evaporation, settling out of tank bottoms, and leaks in lines. Improved pipe coatings, better testing procedures, and the use of cathodic protection have reduced the incidence of line leaks and failures. In product pipelines, contamination may constitute a source of loss by product having to be degraded.

The operation of a pipeline is one of reasonable continuity, and it is perhaps natural that the use of automatic measurement equipment, such as automatic tank gauging, automatic sampling, automatic temperature recording, and large-size positive displacement meters, has been developed to a greater degree in the pipeline function of the industry.

Marine

Marine transportation ranges from the transport of crude in the larger tankers to the transport of finished products in small coasters and barges. Because of improvements in ship design and construction, hull leakage is now exceptional. Evaporation loss occurs during loading, but with the relatively high setting of the pressure vents on the cargo tanks is unlikely to be a serious cause of loss during the voyage. The largest sources of real loss probably arise from

* Paper read to the IP Economics and Operations Group on 19 March 1957.

† Esso Petroleum Co. Ltd.

incomplete discharge of the cargo and clingage to the internal structure after discharge, and this oil may be subsequently pumped overboard and lost in passage to loading terminals and repair ports. When transporting refined products, ships may carry as many as seven grades, and loss by contamination between products may occur.

Errors in measuring and calculating quantities on board tankers arise from errors in calibration, deformation of ships' structure subsequent to calibration, effects of trim and list on ullages, and difficulty in obtaining the overall temperature and specific gravity of the cargo. The ship's quantity is not, however, taken as the primary measure of quantity except on certain barge transportation operations, but it can be used as a secondary check on the shore tank measurements of quantities invoiced and received.

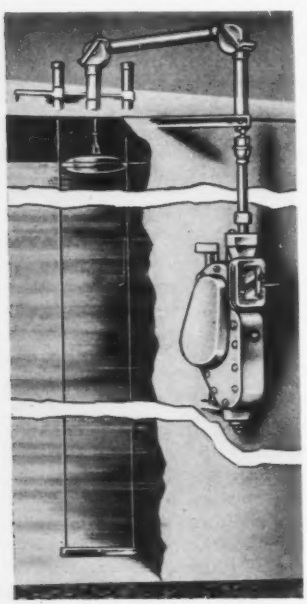
The cost of losses in marine transportation is of interest to other functions of the industry's operations, which usually have to bear the cost of these losses. This is the case in marine transportation of crude to the refineries, and of refined products by tanker, coaster, and barge to the marketing terminals and bulk plants.

Refining

Refining losses are made up of tankage losses, processing losses, and losses in loading transportation equipment. Stocks are not held in refineries for lengthy periods, and installation of floating roof tankage has done much to reduce evaporation losses from light crudes and volatile finished products.

Processing losses increase with increasing severity of the refining operation. These losses show as gas burned at the flare, evaporation from waste water separators, liquid losses in refinery effluent, and losses in discarded clay and catalyst. Refining losses are high at start-up and shut-down of units, when excessive flaring and slopping may be necessary, but under steady operating conditions every effort is made to dispose of gas as refinery fuel or to outside consumers. Efficient separation of oil from refinery effluent recovers oil which can be re-processed, and reduces pollution of harbour waters.

Fig 1



Losses take place during loading of marine craft, rail cars, and road trucks with volatile finished products, and if loading lines to marine craft are long, contaminations can occur, and slopping of contaminated product may be necessary.

Marketing

Marketing operations are widespread over a large number of plants and, in consequence of dispersal, control is more difficult. The laid-down cost of the product by the time it reaches marketing terminals and bulk plants is greater, and in some cases duties have already been paid, so the monetary value of any loss is high. The effect of temperature change is felt to the greatest extent in the marketing operation, since products are purchased in gallons reduced to 60° F, but except for the heated products, and some which are sold

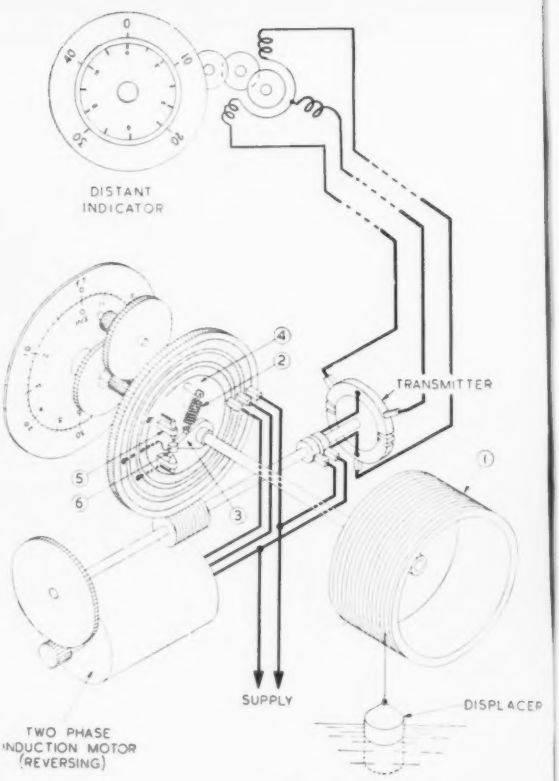
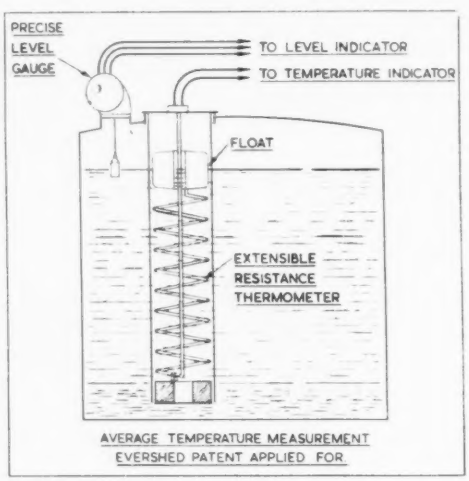


Fig 2

Fig 3



on a weight basis, they are sold in measured gallons. Thus marketers in the warmer climates may, unless they are unduly careless, show a stock gain in their operations, whereas those in cooler climates, however careful, show a loss.

The greatest real loss, as distinct from a measured loss, occurs by evaporation of the gasolines, but attention must also be given to losses of other products. Losses occur due to leaks in tanks, pipelines, valves, and pump glands, spills caused by carelessness, and contaminations between products, which may involve degradation of the product, or return for re-processing. Errors in measurement are important in marketing, where division into small parcels takes place, and repetition of small errors sums up into a large loss.

Concentration of operations in larger and fewer plants reduces the handling factor, enables improved equipment to be installed, facilitates control of operations, and enables an increased amount of product to be stored and distributed from bonded plants.

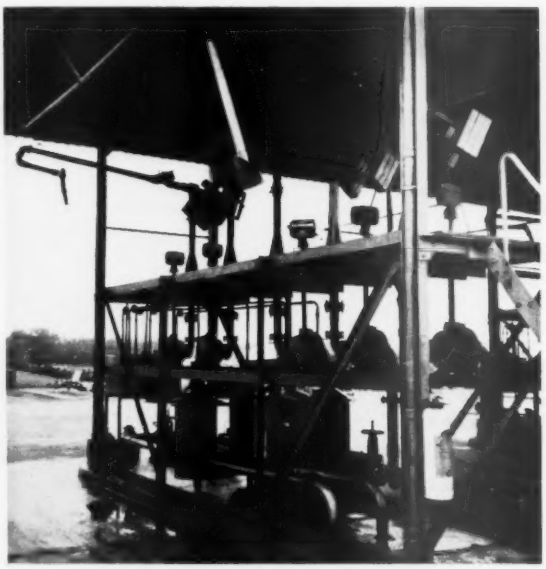


Fig 4

Measurement

Accurate measurement provides the basic data from which oil quantities are calculated and sources of loss determined; unless measurements are accurate, responsibility for excessive loss cannot be properly assigned to operations or within an operation to equipment or personnel.

The most usual method of measuring bulk oil quantities is by manual gauging of calibrated storage tanks. This operation is difficult to carry out accurately under adverse weather conditions or at night; it is dependent on the skill of the operator and is influenced by movement of the surface of the product and bottom sediments. The accuracy of manual gauging under ideal conditions may approach $\pm$ 0·1 inch, but gauging under routine conditions gives errors far in excess of this figure, probably nearer $\pm \frac{1}{2}$ inch. An inaccuracy of 0·1 inch when gauging a storage tank of 120 ft diameter means an error of 588 gallons.

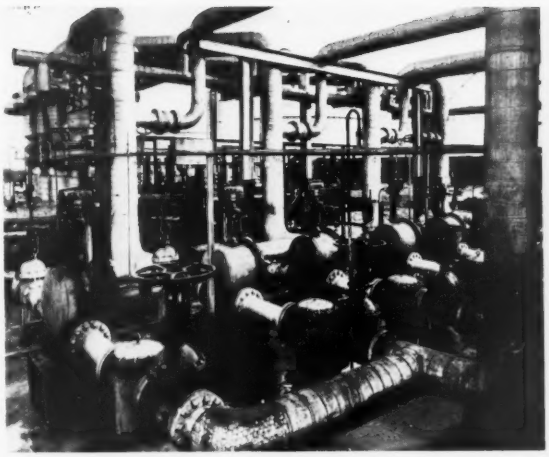


Fig 5

The guided type of float gauge (Fig 1) will give greater accuracy than manual gauging. Although this gauge is provided with a means for checking whether the float is buoyant and not sticking, the tendency seems to be to use it for day-to-day readings only, and to resort to manual dipping for discharges into the tanks and month-end inventory checks. Even when used in this way it reduces evaporation loss caused by frequent opening of dip hatches.

Fig 2 shows a gauge in which the level sensing element is motor operated, which eliminates error due to friction of the mechanism. This gauge transmits its reading electrically to a receiving panel, enabling readings from a number of tanks to be collected at a central point.

Accurate manual measurement of temperature is a difficult and time consuming operation. Fig 3 shows a type of averaging thermometer which gives a rapid and accurate bulk temperature measurement. An inaccuracy of 1° F in measuring the temperature of a full 80,000 barrel gasoline tank means an error of 1680 gallons in reducing to the equivalent volume at 60° F.

One of the most important developments in bulk oil measurement is the extension of the use of the positive displacement meter. Fig 4 shows its application to the tank-truck loading rack. Larger size meters are extensively used on product pipelines, and are coming into greater use on crude oil lines, where the meter may have to handle a moderate amount of solids in suspension. Unfortunately, the use of meters is often hampered because meters of large capacity are not generally available. Measuring of small quantities from refineries and terminals with large tanks and long pipelines into coasters and barges is a difficult operation if the shore tank dip is taken as the measure, and the positive displacement meter appears to offer the solution. Fig 5 shows such an application to loading of lubricating oils, but because of limitation in the size of meters available, two have to be used in parallel to meet the required pumping rate. The calibration and maintenance of meters must be thoroughly understood for their application to be effective.

The development and extended use of mechanical measuring equipment will not only economize in time and manpower, but will give increased accuracy of stock measurement on which the control of losses is dependent.

Locating and Reducing Losses

In all functions of the industry's operations regular and frequent reports of inventories, throughputs, and losses must be prepared. An analysis of these records should show any abnormalities, and enable the causes of loss, both normal and abnormal, to be ascertained. From the results, the extent to which improved equipment can be economically installed, or maintenance and operating methods improved, can be determined. This analysis of loss reports must be continuous; mechanical measuring equipment will no doubt enable loss sources to be traced more readily, but even in its absence analysis over periods eliminates casual and compensating errors in measurements; further, unless loss reports are continuously reviewed, improved conditions have a tendency to deteriorate.

Normal loss is properly intended to mean the minimum loss which can be achieved with the best use of existing equipment. Too often it is thought of as a fairly liberal percentage, and provided the reported loss comes below this figure, no action is considered necessary. Comparative figures of one plant with another are of limited value, unless local conditions such as the nature of the operation, the equipment available, and the weather during the period are taken into account.

Throughout the operations of the industry evaporation probably accounts for rather more than half the total oil loss, and it is natural that much attention has been given to the subject. This loss is affected by local climatic conditions and the survey of evaporation losses in the U.K. by Walker, Eltringham, and Puttick* is a useful contribution. While the primary object of this work was to produce figures to determine the economics of evaporation prevention equipment, their results can be used to determine whether gasoline losses in a plant are normal or abnormal.

Several examples of conservation equipment follow.

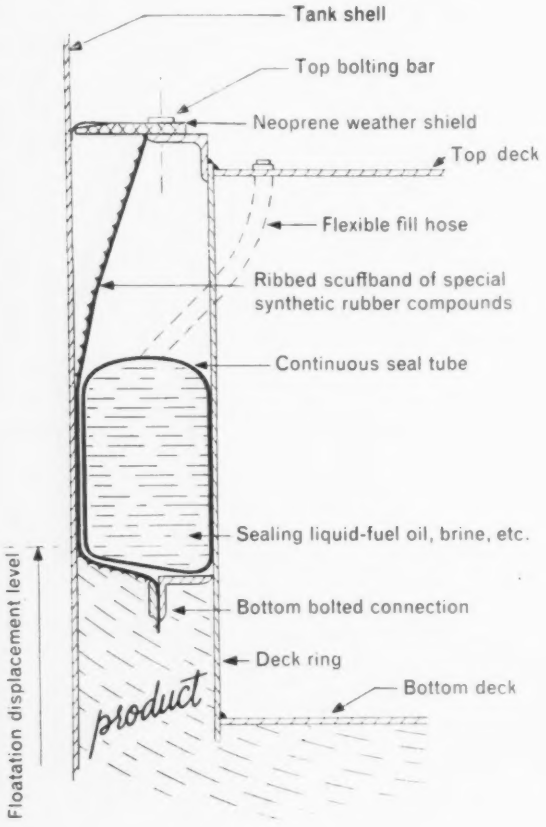


Fig 6

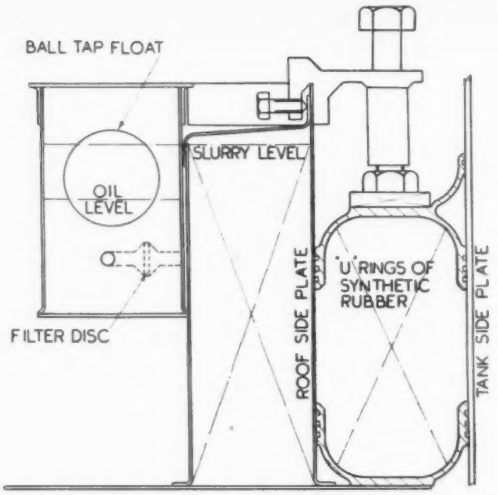


Fig 7. Fluid seal for floating roof tanks

In pipeline transportation and refining, tanks are rapidly turned over and floating roof tanks are used for light crudes and volatile products. By elimination of the vapour space, evaporation loss by turnover and breathing will not occur, but some loss takes place because of the difficulty of making a perfectly gastight seal between the roof and the tank shell. The usual seal consists of steel shoes and a flexible curtain. Fig 6 shows an alternative design incorporating a liquid filled tube supported by a scuff band of oil-resistant synthetic rubber for which simplicity and tightness of fit are claimed.

A new design of seal is shown in Fig 7 in which the seal is a fluid of viscous oil to which suitable solids are added. The fluid is confined by U section rings. A claim for this seal is that the interior of the tank shell can be painted with corrosion resisting paint without damage to the paint by the seal. This will reduce cling and creep losses which would be larger with a rusty tank shell.

When turnover of tanks is not so frequent, it may be difficult to justify the greater cost of the floating roof tank. Increasing use is being made of variable vapour space devices for gasoline storage, of which the vapour tank is one example. This equipment can be connected into existing cone roof tanks. The vapour tank would normally be sized to save breathing loss only, but in practice some saving in turnover loss may be possible if tank fillings and withdrawals coincide. Fig 8 is a view of a vapour tank installation.

Some seventy floating plastic blankets, one of which is shown diagrammatically in Fig 9, are in service. It is

* Walker, E. H., Eltringham, R. M., and Puttick, A. *J. Inst. Petrol.*, 1955, **41**, 297.

claimed that these save about 80 per cent of the evaporation loss which would normally take place from a cone roof tank. For installation, the blanket is rolled up and inserted through the side manhole.

For climatic conditions in the U.K., a tank working at a pressure range of about 22 inches of water will effect a considerable reduction in breathing loss. The cost of a cone roof tank, built for a pressure of 20 inches of water and a vacuum of 2½ inches, is not greatly in excess of the cost of a normal cone roof tank. It is suitable for the smaller tanks up to about 55 ft diameter and can prove attractive where the total gasoline storage is under about 80,000 barrels, below which figure a variable vapour space system would usually be too costly.

These examples are only typical of some of the equipment which is contributing to loss prevention.

Organization for Stock Loss Control

It is necessary to establish a programme for stock loss reduction and an organization to ensure that this programme is carried out. The technical information is available from the specialists in this subject, from the research workers, and from the engineers responsible for the design and installation of plant and equipment. The accountants make available the figures from which the relative importance of the various loss sources can be assessed. One of the most difficult problems is the transmission and application of this information. Relatively few people have stock loss control as their full time activity, and to most it is only part of a wider field of duties. It is, however, on this majority, the operating departments, the plants, the ships' crews, and the field personnel that it is necessary to rely for the ultimate success of a stock loss reduction programme.

Discussion of oil loss prevention problems should form part of the training programme of plant supervisors and operators. These discussions frequently clear up misconceptions and may be illuminating in illustrating the effectiveness with which information is passing downwards.

Oil loss prevention committees are desirable in all functions to review oil losses continuously and to keep abreast of all developments, both physical and accounting, aimed at reducing oil losses to a minimum. Since many loss problems are common to several functions of a company's operations, exchange of information between functions, for example between marine, refining, and marketing, can often point to a solution of a problem or avoid duplication of effort.

Exchange of information is not only of importance within a Company but is desirable within the industry.

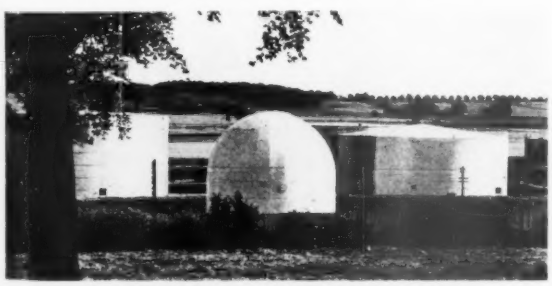


Fig 8. *Vapour tank installation*

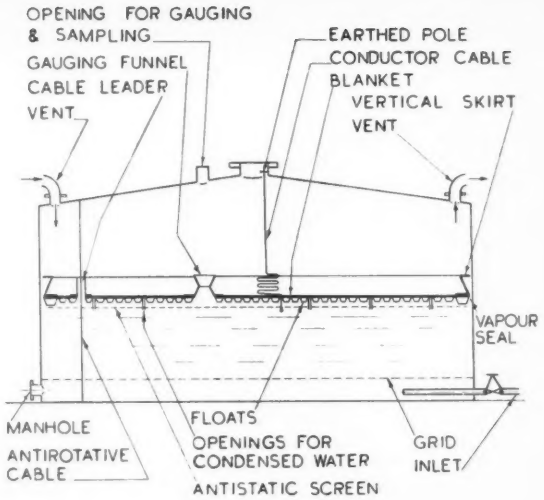


Fig 9. *Laroche blanket*

The API has taken considerable interest in oil loss prevention with committees on crude oil measurement and evaporation loss, and with bulletins, codes, and standards on loss control, measurement, sampling, tank calibration, positive displacement meters, and automatic lease custody transfer. In the U.K. the Institute of Petroleum has done valuable work in its Measurement and Sampling Sub-Committee and its associated panels, and the work of the Positive Displacement Meters Panel is proceeding at present. The API has already published a standard on automatic tank gauges and the IP may have similar work in mind. The oil companies can both contribute and gain by participation in the work of these panels. Since the Government Departments concerned are represented, standards for methods of measurement and measuring equipment will be produced which will conform to their requirements. The co-operation of the equipment manufacturers in the work leads to an exchange of information which accelerates the availability of new and improved equipment.

Stock loss control is a collective as well as an individual responsibility among different functions and at different levels in an oil company's operations. While some problems are peculiar to one function others are common and it is an interest of technical, accounting, and operating departments. It is a subject on which consultation, discussion, and exchange of ideas is profitable.

Acknowledgments

The author thanks the following firms for permission to illustrate items of their equipment:—

Whessoe Ltd, Evershed and Vignoles Ltd, Stemco Ltd, William Neill & Son Ltd, Mechans Ltd, and Laroche Freres.

Discussion

Evaporation losses were referred to quite frequently in the discussion which followed the presentation of the paper. The first speaker, T. H. Craig, asked whether these included displacement losses, which he suggested might be eliminated by blanking off the vapour space with a floating roof or a plastic

blanket. Mr McGechan said that breathing and turnover loss had been taken into account and agreed that the only practical way of eliminating turnover loss was as suggested.

F. W. Forrester asked whether the blanket was a useful means of conserving evaporation losses and the author said that it appeared to have distinct possibilities.

Regarding the use of vapour recovery systems of the vapour dome type, for which the whole system must be at the same pressure as that which can be maintained in any tank, A. H. Stephenson asked whether economics would be affected by having to work at as low a pressure as 2 inches w.g. Mr McGechan said the diaphragm of the vapour tank would work at about ¾ inch w.g. The storage tanks in the particular illustration given were designed for 4 inches pressure but with the pressure and vacuum vents now available this could have been lowered. All breathing was into the vapour tank.

Referring to blankets, D. H. Craig suggested that these were particularly applicable in the older type low-pressure tanks. A general assessment of the saving in evaporation and turnover losses was 60 to 65 per cent and he had seen one with the peripheral seal in perfect condition after seventeen months use. In reply to a question by G. L. Kennaby, the author said that the economic limit for their use was for tanks of 60 to 70 feet diameter.

Dipping Errors

Dipping also aroused much interest and H. Hyams felt that any company experiencing dipping errors of ± ½ inch should take steps first to ensure that IP standard procedure is used, and secondly that their staff was well-trained. Good staff with proper equipment should get repeat readings within 2 mm or less than 0·1 inch. W. L. Coates agreed and considered that the problem was how to retain sufficient skilled personnel. More errors crept in from inaccurate dipping than from any other cause.

A. H. Stephenson felt that an experienced dipper could work to 0·1 inch quite easily and B. C. Ferguson cited a test of dipping precision made in France before the war on a 65-ft dia tank. The gauger, who usually took dips to the nearest millimetre, was asked to take 10 readings and estimate to the nearest 0·1 mm. Two others each took sets of 10 readings without comparing results. The deviation over all 30 readings was about 0·6 mm. Mr Ferguson considered that the main cause of inaccuracy in hand gauging was due to temperature measurement. A variation of 1° F in average temperature of a gasoline tank was equal to about 1/16 inch for every 10 feet of product in the tank.

Automatic Dipping

The use of automatic dipping was first raised by F. W. Forrester, who asked if any progress had been made towards getting H.M. Customs to accept this. To this Mr McGechan replied that while H.M. Customs were interested in the float gauge they were reluctant to accept measurements made with it. He thought that if the IP could take up this subject, the Customs might accept the use of an approved type of appliance.

W. L. Coates thought that, in dipping methods, concentration should be given to the need to eliminate the human factor, but G. A. T. Vickers said that in the U.S.A. three or four automatic gauges in one tank had shown variations of as much as 0·3 inch. A. H. Stephenson, referring to the use of float-operated gauges in tanks containing layers of product of different gravity, said that under such conditions the readings became unreliable. He thought that automatic devices to record the actual level of the product were more attractive than the float type.

B. C. Ferguson pointed out that automatic gauges did not measure oil depth but ullage and any roof movement or tank shell expansion would affect the accuracy. On one low-pressure tank a movement of about ¼ inch (9mm) was recorded at the gauge position.

Another source of error with the float gauge was thermal expansion of the tape, which in the tropics could be as high as ¼ inch. He felt that with present gauges the best accuracy which could be relied upon was ± ¼ inch, but ± ⅜ inch was possibly more normal.

Loss Control Standardization

An important point was raised by H. Hyams, who expressed gratitude to the author for being the first person in Britain to indicate the need for the Institute to extend its work on bulk oil measurement to loss control methods. Mr McGechan had proposed inter-company collaboration on this question, but the time was now ripe for the IP to do something on loss control and oil conservation, which would have to cover all aspects of the industry from the oilfield to the consumer. In the last quarter of a century the Institute had done valuable work in standardizing procedures, techniques, and equipment for measuring and sampling petroleum and, subject to keeping up-to-date by continuous study of the replacement of manual equipment by automatic and electronic equipment, that work was reasonably complete.

There was, said Mr Hyams, a host of information in Britain and the United States on the storage, transport, and handling of petroleum. This should be collated and published and would take the question of measurement on to the next stage – conservation.

D. S. Hudspeth welcomed increased attention by the IP, which could be of value in defining objectives for equipment manufacturers and to define conditions by which this equipment could be tested to requirements.

Temperature Adjustment

On the subject of temperature adjustment, H. Hyams pointed out that if petroleum was imported or bought on the basis of volume at 60° F or 15° C and then marketed at ambient temperature, then there must be losses or gains. But the discussion was concerned with control of actual losses during storage and handling. If these losses were to be based on a volume basis, then stock records must be kept in terms of volume adjusted to a standard temperature.

A. H. Stephenson felt that for comparison between similar operating points, which was often the basis of stock control, readings based on ambient temperature were sufficient on the marketing side, where comparison in terms of percentage loss in relation to deliveries was common practice. Using this method, the monthly leakage of a depot could be materially affected by the incidence of delivery. For example, a low-throughput depot stocking early in the month would have a different loss than a similar depot taking its stocks at the end of the month.

Refinery Losses

The question of refinery losses was raised by G. L. Kennaby, who said that such losses could not always be calculated in terms of volume because in some processes chemical changes caused volume increases. On a weight basis, input equalled product plus loss, but this was not always true on a volume basis.

In a refinery there were other losses than evaporation losses. To mention only two, there was the sludge which separated from crude during shipment and storage, and leakage from pumps. Mechanical seals had done much to reduce the latter.

On the question of sludge separation in tankers, J. A. Sutherland asked for information on the heating of crude oil during a voyage and how the temperature was related to evaporation losses. Mr McGechan said that opinion varied on the amount of heating permissible during transit and discharge.

Ship Calibration

H. Hyams agreed that a ship's tanks could not be calibrated as accurately as shore tanks and that a gauger could not be expected to measure as accurately on board ship as on shore. However, he thought that the need for tanker personnel to work as accurately as possible should not be minimized. First, accurate measurement enabled the captain to keep control over losses experienced on the voyage, and secondly, in remote shore installations measurements by inexperienced personnel with non-standard procedure and apparatus were less accurate than quantities calculated on board.

J. A. Sutherland said that the ship's figures were not of great importance if the tanker was not owned by the company buying the crude. Payment was on delivered quantities. But with small coasting vessels, of which a lot were in use, volume assessment on board could be more accurate than in shore tanks. The calibration of coasting vessels was very important and the need for accuracy should be impressed on owners as ships' measurements were sometimes used as the yardstick for measuring transfers from refineries to installations.

Around the Branches

BAHRAIN, ESSEX, FAWLEY, KUWAIT, LONDON, NORTHERN, SCOTTISH, SOUTH-EASTERN, SOUTH WALES, STANLOW, TRINIDAD

Kuwait Branch

On 9 and 10 June, Frank M. Porter and J. Ed. Warren, president and a director, respectively, of the American Petroleum Institute, visited Kuwait. On their first evening, they were the guests of L. T. Jordan, general manager of Kuwait Oil Co. Ltd, and Mrs Jordan at a dinner where they met senior members of the Company and Committee Members of the IP Kuwait Branch.

On the following day, Mr Porter spoke to members of the Branch on the subject of "The API and Some Problems of the Oil Industry in the U.S.A." He introduced himself as a man who had spent 40 years in the petroleum industry and who was now an independent contractor and producer. He recalled that he had been elected president of the API seven years ago and had held office continuously since then. He said that this office entailed the control of a staff of 350 full-time employees who were largely concerned with the preparation of weekly, monthly, and yearly statistics of reserves, production, refining, marketing, and transport of oil, and also standardization of techniques and equipment throughout the industry.

The API, he said, not only maintained regional officers, who kept up-to-date with local legislation affecting the petroleum industry, but also a large Public Relations Department which, in the last nine years, had spent $20 million. The API also granted large sums of money for research purposes.

He pointed out that, at the present time, membership of the API amounted to about 10,000 persons and represented all phases of the petroleum industry.

Continuing, he said that the API was presently vitally interested in the problem of petroleum imports into the U.S.A. Oil and gas together provided two-thirds of the total energy requirements in the U.S.A. and some 2 million people were employed in the industry. Thus, he considered that a healthy petroleum industry was an essential feature of U.S. economy and security. He then elaborated this theme and outlined a sloping "plateau" of balance between imports and home production.

His talk inspired his audience to ask a number of questions. These were answered either by himself or Mr Warren. Finally, a vote of thanks to Mr Porter was proposed by George T. Becker, chief geologist of Kuwait Oil Co. Ltd.

(Left to Right) *D. S. Curtis, E. Boaden, Frank M. Porter, and J. Ed. Warren in the Kuwait Oil Company's Display Centre, Ahmadi.*

OEEC Petroleum Emergency Group Wound Up

As oil supplies have now returned to normal, the Council of the OEEC decided that the Petroleum Emergency Group (OPEG), set up last November to assist the Organization in dealing with the problems raised by the closing of the Suez Canal and the pipelines of the Iraq Petroleum Company, should be wound up at the end of July. At the beginning of May it was mutually agreed between the Organization and OPEG that the day-to-day activities of the latter should be suspended, although its machinery would be maintained until July in case of necessity.

OPEG consisted of experts designated by the principal international oil-supplying companies in Europe, aided by experts from the American companies taking part in the work of the Middle East Emergency Committee in the United States.

Its function was to advise the OEEC Oil Committee on the availability of oil supplies for Europe, and to assist the Committee in the implementation of its recommendations, particularly on the distribution of supplies among Member countries and Spain.

In reaching this decision, the OEEC Council requested the Secretary-General to express to members of the Petroleum Emergency Group its deep appreciation of the invaluable assistance rendered by the Group in the overcoming of the oil crisis.

Personal Notes

H. E. Snow and the **Hon. M. R. Bridgeman,** managing directors of The British Petroleum Co. Ltd, have recently been appointed deputy chairmen of the Company.

E. B. James, purchasing manager of Fina Petroleum Products Ltd, has joined the staff of the B.E.T. Federation Ltd with a view to taking up an appointment as chief purchasing officer early next year.

F. B. Richardson, M.I.E.E., managing director of M. & C. Switchgear Ltd since 1937, has retired after more than 46 years' service with the Company. He took an active part during the formative period of the Association of Mining, Electrical, and Mechanical Engineers, of which he is a Fellow.

Paul J. Anderson, who was appointed senior representative in the United Kingdom for Standard Oil Company (New Jersey) on 1 July, succeeds **H. W. Fisher** who was recently appointed joint managing director of Iraq Petroleum Company and Associated Companies. He will continue to serve as Middle East representative of the Jersey company with responsibility for Middle East matters handled in London, including the Iranian Consortium and Near East Development Corporation.

Mr Anderson joined the Jersey organization as an attorney in 1934 and has served with the parent company and some of its affiliates in the United States, Latin America, and the Middle East. In 1952, he was named Middle East advisor for the company. In February 1957, he was made the company's London Middle East representative.

G. McHardy, A.I.E.E., has severed his connexion with Wailes Dove Bitumastic Ltd, and has set up as a corrosion consultant, specializing in pipeline protective measures. His address is: 53 Grosvenor Road, Petts Wood, Kent. Telephone: Orpington 25343.

G. N. Peters, retail marketing manager of Shell-Mex and B.P.'s Eastern Division at Ipswich, has been appointed divisional manager, Northern Irish Division in Belfast. He succeeds **R. I. Collett,** who will shortly be taking up a senior appointment in the Power Petroleum Co. Ltd.

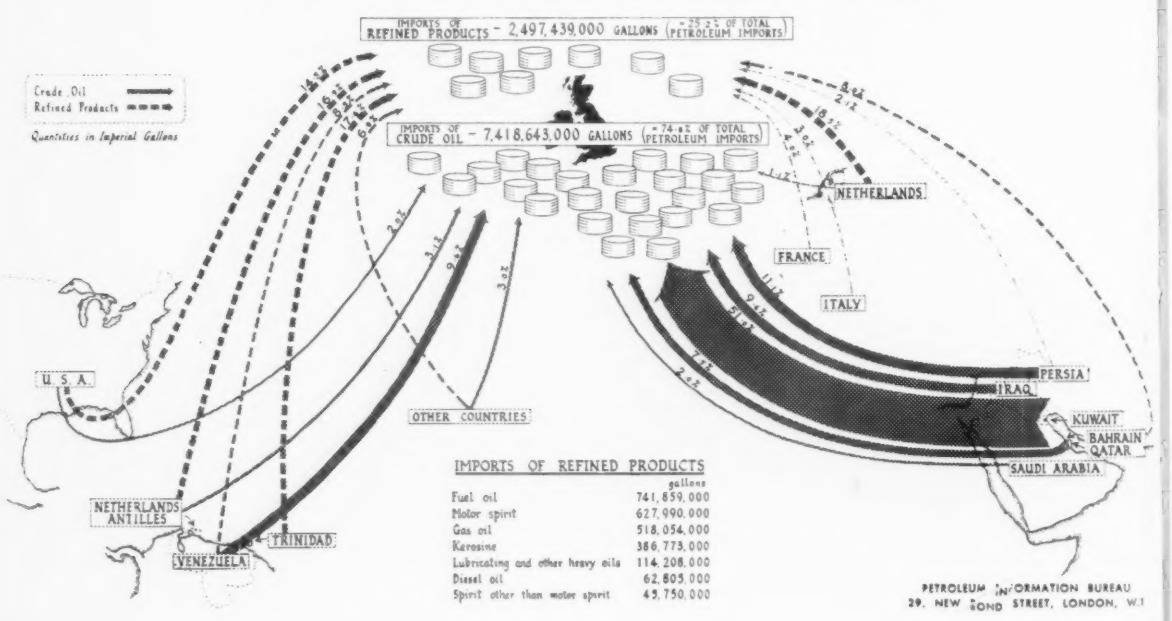
Leroy D. Stinebower and **David J. Jones,** M.B.A., have been appointed assistant treasurers of Standard Oil Company (New Jersey).

Mr Stinebower, who has been European financial representative in London for Jersey, has been succeeded in that post by **Lester B. Johnson,** now an assistant treasurer of the company. Mr Stinebower joined the Jersey organization in 1952 after 18 years with the State Department in Washington, where he served in financial and economic advisory positions.

Mr Jones joined the company in 1947 and has served the Jersey organization abroad since 1950, where his latest post was financial manager of Esso Standard S.A.F.

Mr Johnson has been an assistant treasurer of Jersey Standard since 1954. He joined the company in 1946 as a foreign exchange analyst.

U.K. Imports of Crude Oil and Refined Liquid Petroleum Products—1956



Notes of the Month

British Petroleum's New Home

An artist's impression of "BP House", the new offices now under construction for The British Petroleum Company on a bombed site bounded by Chiswell Street, Finsbury Street, Ropemaker Street, and Moor Lane just outside the City of London boundary and about 250 yards from the present Britannic House. H-shaped on plan, the building will have two wings each of six storeys above ground level with a small portion of one wing extended to eight storeys. The centre block of eleven storeys rising to a height of 125 ft will connect the two wings. The floors from the ground upwards will be for office use, the lower ground floor and basement being reserved for building services and restaurants. Parking for about 85 cars will be provided on two levels.

Canadian Airborne Survey of Southern England

During the past few months, Canadian Aero-Service Ltd have carried out an aerial survey over a wide area of Southern England. The equipment included an Aero-Service Corpn continuous 35-mm strip camera, a Decca Navigator Mk 8 receiver, and a Gulf Research and Development Model III magnetometer. The detector head of the latter was towed behind the aircraft in an object shaped like a bomb. The survey forms part of regional geological and geophysical investigations being conducted by the Geological Survey of Great Britain.

Data Processing Group

The Society of Instrument Technology is setting up a special section to cater for the current interest in data-processing systems. This section will hold its first meeting in London on 10 October. Further information may be obtained from the Secretary, S.I.T., 20 Queen Anne Street, London, W.1. Anyone interested in contributing to the activities of the section should write to the Section Secretary, W. T. Bane, 137 Kenilworth Court, London, S.W.15.

Complaints against Caltex Dismissed

After five years of charges and litigation, the U.S. District Court for the Southern District of New York has dismissed the U.S. Government's suit alleging that Caltex and its parent companies, the Texas Company and Standard Oil Company of California, overcharged European customers for crude oil supplied under the former E.C.A. programme.

In rendering his decision the District Judge said that the Companies "showed beyond contradiction that the prices financed by E.C.A. were in fact the lowest competitive market prices."

Charringtons' New Fuel Oil Terminal

Work is well advanced on the construction of the largest fuel oil terminal in London. Situated on a 10-acre site at Poplar, with a 700-ft frontage on the Thames, its initial capacity will be 18,000 tons.

All grades of Mobil fuel oils will be shipped up the Thames from Coryton refinery and discharged at the new terminal; from there they will be redistributed by Charringtons' road tankers and by rail to customers in the Central London area, S.E. London, and the northern part of Kent.

The estimated cost of the new terminal is £400,000.

British Plastics Exhibition

Reports of the 1957 British Plastics Exhibition and Convention held recently at Olympia, London, indicate that it resulted in brisk home and export business. One manufacturer of plastics machinery, for example, reported sales to the value of £350,000, of which 60 per cent was export business.

Attendance at the Exhibition was exceptionally high, reaching a total of 90,000 visitors, including 6000 from overseas. This was more than double the number who attended the 1955 show. It is anticipated that the Exhibition to be held in June 1959 will be on a much larger scale.

Standard Oil's Capital Expenditure

Standard Oil Company (New Jersey) estimates that capital and exploration expenditures by consolidated companies for the first six months of 1957 were approximately $629 million. This represents an increase of more than 50 per cent compared with the expenditures made in the first half of 1956. Of the total 1957 outlay, additions to property, plant, and equipment were $508 million, while other expenditures in the search for oil and gas charged against current income were $121 million. Over 85 per cent of the total expenditures were made in the Western Hemisphere, with more than half of that amount spent in the United States.

Oil Search in France and West Africa

The Société des Pétroles de Valence (in which the B.P. Group has a 50 per cent interest) plans to drill a first deep test well in its Luberon licence area, north of Marseilles, this autumn. In the Valence Basin, as reported in July, the Company is to drill a second test well at Montmiral now that the first well at St. Lattier has been completed.

In French West Africa the Société des Pétroles du Senegal (in which the B.P. Group also has a 50 per cent interest) is continuing intensive geophysical surveying which, it is hoped, will lead to a location being chosen in Southern Senegal where deep test drilling may begin later this year.

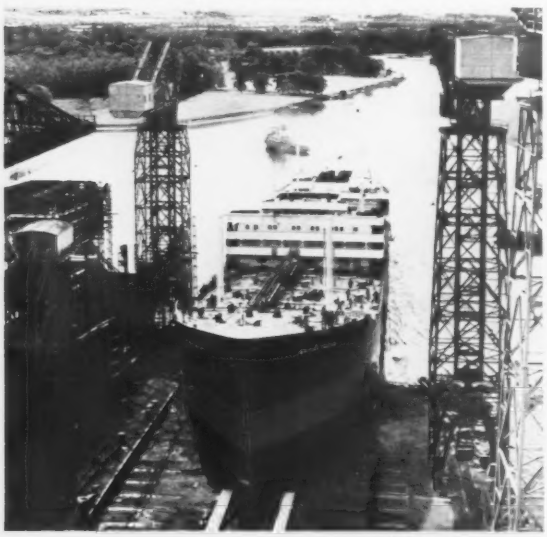
Development of Clean-burning Gasolines

During the past 2½ years, experiments have been conducted at the Esso Research Centre, Linden, N.J., in order to determine the best ways of making gasolines which do not create knock-causing deposits. Minute quantities of radioactive compounds were added to ordinary gasoline and the mixture was run in a special auto test engine.

By analysing the radioactivity of the deposits formed in the engine, it was possible to determine which components of gasoline were the culprits and which were harmless.

It was concluded that gasoline components with the higher boiling points were most likely to cause deposits, and that certain high-boiling aromatics were among the worst offenders. Therefore, in order to make a clean-burning gasoline, it was necessary to exclude the heavy material from the gasoline and to keep a careful check on its hydrocarbon constituents.

Launch of *British Trader*



A BP photograph

British Trader *seen moving down the slipway after being launched by Mrs Gillespie, wife of R. Gillespie, C.B.E., a managing director of The British Petroleum Company, on 26 June, at the Clydebank yard of John Brown (Clydebank) Ltd. This is the third* 32,000-*dw ton tanker to be launched this year for the BP Tanker Company.* British Valour, *the ninth* 32,000 *tonner to be placed in service by the Company, was recently reported to be on her maiden voyage to Kuwait.*

Guard Your Hands

Each year The Royal Society for the Prevention of Accidents, through its Industrial Safety Division, launches an important nation-wide campaign to reduce accidents in industry. In selecting the theme for the 1957 campaign, the Society was influenced by the appalling number of accidents that occur every year to persons engaged in handling goods. In 1955, for example, of 163,322 reportable accidents, no fewer than 44,613 persons were involved in handling accidents in factories alone, so this year's slogan "Guard Your Hands" is particularly apt. Campaign week for 1957 will be from 30 September to 4 October.

Jersey Standard Grant for Education

A grant of $1·5 million to finance a special 3-year programme for education in science and engineering has been announced by Standard Oil Company (New Jersey). The grant is being made to the Esso Education Foundation, established in 1955 to give financial aid to private colleges and universities. In 1955 and 1956 the Foundation's contributions to such institutions totalled $2,260,000. The present grant is in addition to substantial grants to be made later this year.

Making the announcement of the $1·5 million gift made in observance of the Company's 75th Anniversary, Eugene Holman, chairman of the Board, said it would help to meet urgent educational needs. It would in addition stimulate new thought and research and the company hoped it would inspire other organizations to contribute support. He concluded: "The progress of mankind rests in a significant degree upon the progress of science and engineering".

Second Shell Multigrade Oil

Shell is now introducing on the U.K. market a second multigrade motor oil—Shell X-100 Multigrade 20W/40—to cover a still wider range of motoring needs than the existing Shell X-100 10W/30 multigrade.

This oil is designed specially for the motorist (and motorcyclist) who normally uses a 40 grade, or for those who, though using a 30 grade, would welcome a heavier multigrade than 10W/30.

It will appeal particularly to the motorist who habitually drives fairly hard, and also to the driver of the not-so-new car whose oil consumption, due to engine wear, may be high.

Shell X-100 Multigrade 20W/40 is said to flow as freely as a 20W grade at 0° F, and to have the characteristics of a 40 grade at normal piston ring temperature.

It is now on sale throughout the British Isles, in an attractive new white "fruit can" with the name of the grade in red, at the same price as the Shell X-100 Multigrade 10W/30.

NB Rubber Company's Expansion

Twelve months ago the U.S. Rubber Company obtained a controlling interest in the North British Rubber Company and embarked on a £3 million expansion and modernization programme at the Company's Edinburgh factory. Some of the new machinery has been installed and is already producing a range of rubber and plastics products.

Prior to this expansion, a new section was built, in 1954, for the manufacture of heavy oil hose, *e.g.* submarine, suction, and discharge hose, which quickly established a good reputation in the petroleum industry. Subsequently, in response to the oil companies' requests for stronger, larger, and yet lighter hose which would facilitate the loading and

unloading of heavy oil tankers, the Company has produced two new types (H.1515 and H.1818) in which high-tensile steel wire replaces the conventional cotton duck. It is claimed that this new hose is already achieving outstanding success in many parts of the world.

Nuclear-powered Tankers

Babcock & Wilcox Ltd announced recently that, in collaboration with Cammell Laird & Co. (Shipbuilders & Engineers) Ltd, they have been considering the application of nuclear propulsion to ships since April 1956. In view of the high capital cost of a nuclear installation, the nearest approach at present to economic competition with conventional power is the large oil tanker. A study has recently been completed for a 65,000-dw ton tanker using a gas-cooled graphite-moderated reactor design developed from Calder Hall.

It has also been announced that the first task of Hawker Siddeley John Brown Nuclear Construction Ltd will probably be connected with the problems of marine propulsion. This new Company has been formed with a capital of £500,000 by the Hawker Siddeley Group and John Brown Ltd. At a press conference, E. Mensforth, C.B.E., a director of John Brown Ltd, said: "It is unlikely that a nuclear-powered vessel, particularly if it is to exploit its unique characteristics, will escape the current trend for merchant ships, especially tankers, to become larger".

Persian Gulf Supply Fleet

The first vessels of a small supply fleet shortly to be assembled in the Persian Gulf left London docks in July for Das Island. The fleet will carry food and materials from Bahrain to a base being built at Das Island. From Das the vessels will supply the men aboard the drilling barge *Adam Enterprise*, which will be used for the first underwater deep test well to be undertaken by Abu Dhabi Marine Areas Ltd. Drilling is due to begin early next year.

Two 100-ton barges were deck cargo on the *City of Durham* when she sailed from London on 22 July. Portable tanks can be installed in both these barges to enable them to carry fuel oil as well as dry goods. Three more 100-ton barges building in Newcastle were due to leave for Das Island last month and will be joined later by a 30-ton refrigerated barge.

Three 73-foot steel tugs are also being built for the project. The first of these was due to undergo trials in August and then to sail for the Persian Gulf.

Drilling for Gas in Yorkshire

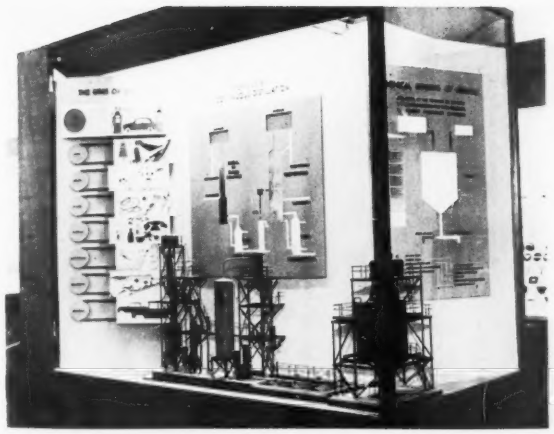
BP Exploration Co. Ltd, in conjunction with Imperial Chemical Industries Ltd, has re-started test drilling for natural gas in the Eskdale area of North Yorkshire.

Two previous wells—one drilled before the last war, the other in 1954—found some gas at Eskdale. The purpose of the well now being drilled is to determine as far as possible the extent of this potential gas field and to estimate whether sufficient gas is present to justify the cost of building a pipeline to carry it to I.C.I's works at Billingham and Wilton on Tees-side.

This investigation is quite distinct from the search for natural gas undertaken by BP on behalf of the Gas Council.

Benzole Refining Exhibit

This exhibit, which occupies an island site in the Industrial Chemistry Gallery, was formally presented to the Science Museum on 29 July by L. B. Blundell, president of the



National Benzole Association. It was received on behalf of the Museum by Dr Morrison Scott, the Director. Refining of crude benzole is demonstrated by three models, each backed by an animated panel explaining the operation. The models show a continuous-distillation unit, a benzole washing plant, and a batch still. The many uses of benzene are shown on a static panel, while other panels illustrate its origin and history.

New Oil Drilling Outfit Arrives in Nigeria

A new oil drilling outfit, capable of reaching a depth of 12,000 feet, was recently transported to the site of its first operation, the Ituk No. 2 exploration well (Calabar Province, in the Eastern Region of Nigeria) which was suspended in August 1956, due to technical difficulties. The new rig, a National 80B, is on contract to Shell-B.P. Petroleum Development Company of Nigeria, from Nederlandschse Boormaatschappij N.V. (Drilvo), who already have one similar drilling string in operation for Shell-B.P. in Nigeria.

This new addition to Shell-B.P's drilling strength in Nigeria will bring the total of rigs in operation there to five and will permit an increase in the scale of the Company's exploration activities.

Daura Refinery Expansion

The Government Oil Refineries Administration have recently awarded a £3,700,000 contract to Foster Wheeler Ltd for the expansion of Daura Refinery. The new equipment includes a crude unit, a 5000-b.s.d. catalytic reforming unit (Esso Research and Engineering Co. Powerformer), an acid treating unit, a 2000-kW turbo alternator, a cooling water tower and circulating pump, and storage tanks with interconnecting piping.

The additional plant, which is scheduled for completion within 2 years, will almost double the present refinery throughput, and the ultimate throughput of 48,000 b.s.d. is expected to more than meet Iraq's demand for gasoline, kerosine, and fuel oils during the next few years.

The *Shell Magazine* Gains American Award

At this year's annual conference of the International Council of Industrial Editors recently held at Boston, U.S.A., *Shell Magazine*, the house journal of the Shell Petroleum Co. Ltd, was awarded a certificate of merit in its particular class. It is of considerable interest to note that *Shell Magazine* was the only British oil journal to secure an award and that the total number of entries was 807.

Photo by La Presse, *Montreal*

Members of the Storey Mission in Montreal. Seated are J. M. Storey, leader (Dewrance & Co. Ltd) and (right) *G. L. Hancock, deputy leader (David Brown Industries Ltd), with E. C. Whiteley (Metropolitan-Vickers Electrical Export Co. Ltd) to the* left. *Standing are* (left to right): *A. J. Banks (Winn & Coales Ltd), S. W. Hoskins (I.V. Pressure Controllers Ltd), S. J. Harley (Coventry Gauge & Tool Co. Ltd), A. V. Flagg (The Steel Equipment Co. Ltd), A. A. Kaye (British Thomson-Houston Export Co. Ltd), G. R. Guest (F. Perkins Ltd), R. J. Anderson (Imperial Chemical Industries Ltd, Metals Division), R. C. Bird (Pethow Ltd), A. G. Ellison (The Yorkshire Copper Works Ltd).*

The Storey Mission Reports

The Canadian oil and petroleum chemical industries are eager to buy from Britain. They buy mainly on price, on delivery, and on after-sales service. The price of British manufactures seems to be good, but delivery times and service need to be looked into. That was how J. M. Storey, leader of the CBMPE Economic, Technical, and Goodwill Mission to Canada, summed up the opinion of the Mission.

Mr Storey, who was speaking at a Press Conference in London on 25 July, emphasized that writing letters would not get Canadian orders. To sell to that thriving Dominion it was necessary to go there in person and carry out some high-pressure selling on the spot. The Mission had gained the firm impression that, provided U.K. manufacturers made the effort, there was a ready market in the Canadian oil and petroleum chemical industries. But, asked Mr Storey, is this effort forthcoming? Too many manufacturers were content to supply the easier home market. The essentials to success in Canada were maintenance of good stocks and plenty of spares; to have skilled representatives calling on firms; a constant flow of technical literature; and a 100 per cent after-sales service.

Mr Storey paid a special tribute to the assistance which the Mission had received throughout from the U.K. Trade Commissioners in Canada. At all points they had made arrangements for mee.ings and interviews at the highest levels and had not ove.looked the social side also.

The chair at the Press Conference was taken by Derek Walker-Smith, T.D., Q.C., M.P., Minister of State, Board of Trade. He said that the success of the Mission was due to the vigour and enthusiasm of Mr Storey and his colleagues. He hoped that the British petroleum equipment industry would take advantage of the findings of the Mission.

THE MISSION'S REPORT

The full report of the Mission is expected to be published shortly, but the main points were summarized at the Conference.

Oil Equipment Expenditure

Current expenditure in Canada on oil and petroleum chemical equipment is $750 million annually, increasing to an average of $1000 million annually.

Canada's consumption of oil products *per capita* is the second highest in the world. In the last ten years the daily crude oil capacity of Canada's refineries has increased from something less than 300,000 barrels to 700,000 barrels.

Mr Storey particularly referred to the assistance received from the trade commissioners during their visit. He is seen here (centre) *with J. M. Marshall* (right), *U.K. Trade Commissioner for Alberta, and A. J. Banks* (left), *another member of the mission.*

Refining Capacity

Refining capacity is estimated to increase for the next 10 to 15 years at between 6 and 7 per cent per annum. The refining investment is required to increase crude throughput, to improve products quality, and to provide chemical feedstocks. Imperial Oil Ltd refines and markets about 43 per cent of total requirements; British American Oil Co. Ltd (Gulf Oil), 15 per cent; Shell, 11 per cent; and McColl-Frontenac (Texas Oil Co.), 10 per cent. There are over twenty refining companies in Canada.

British Equipment

Only a very small percentage of total purchases of oil equipment is from U.K. sources. The type of oil equipment is modelled on the American pattern. In the oilfields some 90 per cent of material supplies are from the U.S.A., in the refineries about 50 per cent, with another 25 or 30 per cent imported in the knocked-down state and assembled locally. Refinery equipment of truly Canadian origin is about 18 per cent.

Purchases from the U.K. appear to be limited to items in short supply, such as large-diameter pipe. Aggressive selling has produced results—some 50 per cent of Imperial Oil's requirements of welded fittings are from one U.K. manufacturer. Some British valve makers have established a market by having stocks readily available. U.K. equipment does not represent much more than 5 per cent of the total. During the last three years, about $53 million worth of pipe was imported from the U.K.

Purchasing Practice

Project purchasing is usually done through the specialist contractors, to whom the selling effort should be directed. The ideal procedure is to acquaint the oil companies' engineers with the product and its availability, in order to be included on the approved list. The contractor should also be approached so that his tender can be based on the equipment in question. Often the latter sales effort has to be undertaken in the U.S. headquarters of the contractor.

Conclusions

The general conclusions, and recommendations of the Mission are, briefly:

(1) It is essential to visit the whole area of the territory personally, since agents and trading conditions vary widely.

(2) Competitive delivery periods must be offered and maintained—three months for routine purchases, up to nine months for capital goods, and up to twelve or fifteen months for goods in short supply.

(3) It is essential to maintain stocks and spares, to have qualified representatives, to provide good sales literature, and to deal quickly with enquiries.

(4) A newcomer should start in Calgary and Edmonton and so cover the oilfield equipment market. Refinery or petroleum chemical equipment and pipelines could be covered up to about 75 per cent from Toronto, although another office in Montreal would be desirable.

(5) The volume of U.K. sales in the past has been limited owing to long delivery periods and lack of service.

(6) Price and quality of British goods were competitive.

(7) There is need for active aggressive selling. Even British manufacturers of world-wide reputation are unknown in some parts of Canada.

(8) Canadian users welcome and encourage competition.

PEMBINA OIL FIELD
June 1953, Socony-Vacuum Exploration Co. discovered the first well in the area 35 miles south of here and, in a short time, the Pembina oil field was developed. Within three years it became the largest producing field in Canada and was considered by some oil companies to be the biggest field on the continent. Land has been leased for as high as $2,500 an acre, although the area remains a wilderness of forests and muskeg. Production from this field plays an important part in the industrial development of the West.

During their visit to the Pembina oilfield the Mission were the guests of the Mobil Oil Company of Canada Ltd. Their guides during a visit to the field were (left) *N. G. (Slim) McCallum, and* (right) *John McCubbin.*

Books and Films

Maritime Transport

The OEEC Maritime Transport Committee's report covering developments in the field of maritime transport during 1956 contains valuable statistics on the world's merchant fleets.

In the tanker field it is shown that during the year ended 30 June 1956, the Liberian fleet rose by 828,000 gross registered tons to a total 3,184,000 g.r. tons. The Liberian fleet was thus the fourth largest in the world. Also at the end of 1956, tankers under construction accounted for 3·7 million g.r. tons out of a total for all merchant ships (over 100 tons) of 8·5 million g.r. tons.

The conditions most favourable to nuclear power for ship propulsion are referred to and it is suggested that the tanker of 35,000 to 80,000 tons is the type of ship which best conforms to the criteria.

The report, price 11s, is obtainable from H.M. Stationery Office in the U.K. and from OEEC Sales Agents in other countries.

Technical Education

Reports recently published by and obtainable from the London and Home Counties Regional Advisory Council for Higher Technological Education, Tavistock House South, Tavistock Square, London, W.C.1. are of considerable interest. They are:

Research for Industry

This surveys industrial research in progress in technical colleges in the Region in 1956. The entries are arranged alphabetically under college and department and information is given on the nature of the research and on the collaboration from industry. Price is 1s 6d, post free.

Engineering Education

Details are given of all engineering courses held in the region in 1956-7, and it is suggested that, as a general indication of the distribution of courses, it will hold good for 1957-8. Price is 2s 6d, post free.

Courses in Higher Technology

The Council has also just issued the first part of its *Bulletin of Special Courses in Higher Technology*. Covering the Autumn 1957 term, it gives details of such part-time and special full-time courses as are being held in the Region. Management studies and commerce are included and the index entries vary from accounting for managers to X-ray diffraction, with such matters as atomization of liquids, gas-liquid chromatography, lubrication theory and practice, oil burning technology, and wax chemistry and physics, to mention but a few. Price is 3s post free, or 5s to include Part II, Spring and Summer Terms.

Corrosion Prevention

Published by Wailes Dove Bitumastic Ltd, *The Protector* is an attractive house magazine devoted to the use of bitumens as protective coatings for various purposes. The recent Spring issue covers many aspects of the use of bitumen enamels including penstocks in the Cimego Hydro Electric System, the coating of pipelines in British oilfields, the protection of steel roofs in aircraft factories, and the protection of piers and similar structures in rivers and seas. Copies are obtainable from the Publicity Manager, Wailes Dove Bitumastic Ltd, Hebburn, County Durham.

Standardization

In its report for the year ended 31 March 1957, the British Standards Institution records that the close collaboration between the IP and the BSI is now bearing fruit. Two further standards issued during the year were technically identical with IP methods. They are BS 2834 (acid and base numbers) and BS 2839 (closed flash point, Pensky-Martens). The ASTM/IP Petroleum Measurement Tables have also been issued as BS Handbooks, No. 15 being the British Edition and No. 16 the Metric Edition.

Work in hand at the end of the year included revisions of BS 210 (classification of lubricating oils), locomotive lubricating greases, a revision of BS 209 and 742 to be published as one standard on "oil fuels", and tests for grease drop point, Abel flash point, specific gravity, TEL in gasoline, water, and sediment.

Co-operation by the IP Viscosity Panel in the revision of BS 188 (viscosity) will result in complete alignment of viscometers used in the oil and chemical industries.

Petroleum Equipment

A draft pressure piping code for the petroleum industry, prepared by the OCMC, has been considered by a BSI Committee and will be circulated for comment.

The second standard on butane–propane gases, dealing with domestic heaters, was issued as BS 2773: Part I, and a third standard, on water heaters, and a standard in lighting appliances are being issued for comment.

A revision of BS 1560 (steel pipe flanges and flanged fittings) was circulated for comment, and the revision of some valve standards was started.

International Standards

ISO/TC 28 sent to the General Secretariat draft recommendations covering the ASTM/IP Petroleum Measurement Tables and also knock-rating methods. Draft proposals were also circulated on various test methods.

Two working groups were formed by ISO/TC 67 to deal with pipelines, flanged fittings, and flanged valves.

Codes of Practice

At the request of the Institution of Heating and Ventilating Engineers a draft code to cover domestic and industrial oil firing installations is being prepared by a committee convened by the Institution of Mechanical Engineers.

A code (CP 339) covering domestic butane gas installations was published in three parts, dealing respectively with: (1) permanent dwellings; (2) caravans and small non-permanent dwellings; (3) boats, yachts, etc.

Copies of the report, price 7s 6d net, are obtainable from the BSI, 2 Park Street, London, W.1.

British Chemicals

The 1957 edition of *British Chemicals and Their Manufacturers*, just published by the Association of British Chemical Manufacturers, contains references to over 12,000 chemical products and the names of the actual manufacturers of those products. It is claimed to be unique in the latter respect. In addition to a list of chemicals and their manufacturers, a considerable amount of other useful information is given. For example, there is a classified list of indicators and microscopical stains, a list of proprietary trade names, and a list of proprietary and trade marks. Copies of the booklet are obtainable free of charge by persons or firms interested in the purchase of chemicals and enquiries should be addressed to the ABCM at Cecil Chambers, 86 Strand, London, W.C.2.

Behind the Headlines

This film, which was recently shown on all BBC Television areas, by arrangement with The Gas Council, is devoted to the development of Britain's gas grids. It portrays the opening of the new works extension at Litchurch, Derby; the closing of small, uneconomic works; the main-laying in Fawley refinery to take "tail" gases; and the extraction of methane from Point of Ayr colliery.

There is also an interview with Sir Harold Smith, chairman of The Gas Council, at Watson Research Station, who explains the purpose of gas grids and the search for natural gas. Finally, some shots are included from the films *Natural Gas* and *Pipeline for Wales*. Its running time is approximately 10 minutes.

Fifth World Petroleum Congress

The Fifth World Petroleum Congress is to be held in the Coliseum, New York City, in early June 1959, and the various categories of new information to be presented for discussion by oil technologists were considered recently at a meeting in Germany of the Permanent Council of the World Petroleum Congress.

This meeting was presided over by Eger V. Murphree, chairman of the Council and president of Esso Research and Engineering Company, and was attended by representatives of eight of the countries concerned with the Congress.

After the meeting, Mr Murphree said that the purpose of the World Petroleum Congress was to exchange technical information relative to the petroleum and allied industries on an international scale and one problem to which new knowledge would be brought would be the increasingly difficult and costly one of finding new oil supplies. He added: "Many promising ideas are being developed in a number of countries. The Congress, in bringing these ideas together, will undoubtedly make a real contribution to this big problem of supplying the world with more energy".

Also, a highlight of the Congress will be a symposium on the exploratory use of atomic energy for new methods of processing oil and for creating new oil products.

Mr Murphree said that the Congress will cover only technical matters and will not be concerned with any commercial phases of the industry. Among the key subjects to be covered in some 200 papers are the following:

(1) The technical problems in searching and drilling for oil in off-shore regions, as well as in new land regions.

(2) New techniques for recovering more oil from oilfields, and the use of new mathematical methods and high-speed electronic computers.

(3) The study of formations several miles under the earth's surface by the use of atomic particles.

(4) Contributions to methods of making new plastics and new types of synthetic rubber and synthetic fibres.

The Permanent Council of the World Petroleum Congress in session at the Schlosshotel Kronberg, near Frankfurt am Main.

(5) Improved and entirely new refining methods designed to contribute to oil conservation by obtaining more useful products from crude oil, and by more efficient utilization of oil products in fuel-consuming devices—such as automotive and aircraft engines.

(6) The relationship of unconventional fuel-consuming equipment, *e g*. the free-piston and gas turbine engines, to the types of petroleum products needed in different areas of the world.

(7) The most modern techniques for removing sulphur from petroleum as well as new ways for the utilization of the by-product.

(8) International standardization of methods used to inspect and evaluate petroleum products, thus leading to a better understanding among petroleum technologists, and to better technical knowledge on which to base future scientific progress.

It is expected that attendance at the Congress will total about 6000 persons and several floors of the Coliseum will be devoted to an International Exhibition presenting the latest developments in equipment used in all phases of the petroleum industry. This exhibition will commemorate the centenary of the Drake well, the first well to be drilled specifically for oil

The New York Congress is the Fifth in the series inaugurated by The Institute of Petroleum (then the Institution of Petroleum Technologists) in London in 1933 The second was in Paris in 1937, the third in The Hague in 1951, and the fourth in Rome in 1955.

The British delegation to the Permanent Council meeting consisted of Sir Stephen Gibson, C.B.E. (second from right), *Lt Col S. J. M. Auld* (third from right) *and Dr E. B. Evans* (fourth from right). *Others seen in this picture are* (left to right): *A. A. Muston* (*Italy*), *T. Salvadori* (*Italy*), *X. Normand* (*France*) *and* (extreme right) *R. Navarre* (*France*).

Aramco 1956 Operations

Although the Arabian American Oil Company (Aramco) had, as a result of the Suez intervention, to reduce its production of crude oil from an average of 1,042,395 barrels a day during the first ten months of the year to an average of only 704,802 barrels a day during the last two months, production for the year 1956 averaged 986,129 barrels a day—a record which exceeded the 1955 daily average by 21,088 barrels. These facts are included in the Company's 44-page report to the Saudi Arab Government. Statistical details are given in Table I, and some of the highlights from the report, which is profusely illustrated, follow.

Exploration

Four seismic parties, three structure-drill parties, and one gravity-magnetic party were at work for up to ten months of the year in various parts of the Concession area.

In the Rub' al-Khali (the "Empty Quarter"), one structure-drill party worked in the south-western and western areas, a pioneer seismic party operated in the remote south-western area, a seismic party in the central area, and a gravity magnetic party in the eastern area.

Outside the "Empty Quarter" two structure-drill parties were at work in the west-central area and north of the Great Nafud. Of the two seismic parties operating outside the Rub' al-Khali, one concentrated on structural delineation of the Abu Hadriyah and Khursaniyah fields. The other carried out definitive reconnaissance in the northern Summan area.

Drilling

Due to a major discovery of oil in the Khursaniyah wildcat, and partly as a result of other drilling operations, the Company's reserves at the end of 1956 were estimated at 34 billion barrels, compared with between 30 and 35 billion barrels in the previous year.

The discovery well, a wildcat, 84 miles northwest of Dhahran and 31 miles northwest of Jubail, was eventually drilled to 7612 feet and proved the A, B, C, and D zones of the Arab zone and the middle Jubailah zone to be productive.

At the end of the year, five drilling rigs were operating at Dammam, Khursaniyah, Safaniya, Abqaiq, and 'Ain Dar. An additional rig was being used for repair work in the 'Ain Dar area. The Dammam well, begun in October, was a deep test to determine the possible presence of gas not associated with oil.

Of the twenty deep wells completed during the year, fifteen were oil wells, one was an observation well, two were water-injection wells, and two were abandoned. The completion of 'Uthmaniyah 44 at a depth of 6896 feet in 37 days set a new drilling record for the Ghawar field.

Production

At the end of the year, owing to the cut back in production during the last two months, only 114 of the Company's 164 wells capable of the immediate production of crude were producing. Most of the crude came from the 140-mile-long Ghawar field, the leading producing field since 1953. Producing facilities of this field were increased during the year by the completion of eleven wells and by the placing on stream in November of its eighth gas-oil separator plant. On 25 December, Ghawar's cumulative production of crude passed one billion barrels. The Company continued its long-term programme for conserving the natural gas produced in association with crude. This programme is designed to assist in maintaining the reservoir pressure and will help in the maximum economic recovery of Ghawar crude. High-pressure gas was, for example, injected into the top of the Abqaiq structure at an average rate of 146,300,000 cu. ft a day during the year. Moreover, to supplement gas injection, water injection began at Abqaiq at the northern end of the field on 7 February 1956, and by the end of the year 40,000 barrels a day were being injected through three water-injection wells.

TABLE I
Aramco Operations in 1956

	1956	1955
Crude oil production	*Barrels*	*Barrels*
Total	360,923,384	352,239,912
Daily average	986,129	965,041
Crude disposal		
To Tapline facilities at Qaisumah	120,606,636	117,988,503
To Ras Tanura refinery tankage	72,662,690	74,161,893
To Bahrain via pipeline	58,026,072	63,150,219
To tankers at Ras Tanura ...	108,868,700	96,646,851
Refining operations		
Crude processed	72,662,690	—
Principal products		
LPG	21,412	—
Gasoline	10,872,581	—
Jet fuel	2,101,830	—
Kerosine	3,949,365	—
Diesel oil	15,059,466	—
Fuel oil	35,404,065	—
Asphalt	244,870	—

Refining

The Ras Tanura refinery processed 72,662,690 barrels of crude during 1956, this total being 2 per cent less than in 1955. The total yield during the year amounted to 72,017,105 barrels of refined products. These were processed mainly from the heavier crude oils, such as those from the 'Uthmaniyah area of the Ghawar field and the Arab-C zone of the Qatif field, which yield less kerosine and gasoline, and more fuel oil, than do the other Aramco crudes which were produced in 1956. Towards the end of the year, work started on the construction of a hydrofiner, designed to process 15,000 b.d. of diesel oil and to reduce the sulphur content from 1·14 per cent by weight to 0·10 per cent. This unit is scheduled for completion in 1957.

Plants and Pipelines

Pipeline facilities were expanded to a peak capacity of some 1,200,000 barrels a day. The most important project

completed in 1956 was a third pipeline, 43·6 miles in length and 30-32 inches in diameter, from Abqaiq to Qatif Junction.

As a result of the new extension of the 'Uthmaniyah-Abqaiq pipeline to 'Uthmaniyah gas-oil separator plant 3, the Company's available producing capacity was increased by approximately 100,000 barrels a day. The laying of gathering lines from new wells to existing gas-oil separator plants in the Abqaiq and Ghawar fields also raised total capacity.

At the end of the year, an auxiliary pumping unit was being installed at Wari'ah and a similar pumping unit was scheduled for construction during 1957 at Tufaih. A new 180,000-barrel tank was planned for construction at Nariyah to assist in accommodating the increased flow of oil to Tapline's facilities.

In order to help meet the Company's growing demand for electric power throughout its three districts, which are linked by 81 miles of 66,000-volt transmission lines, a fifth combustion gas-turbo generator came into operation in December. Situated at the Dharan power plant, this generator has a capacity of 5600 kW.

Construction of the 22-inch pipeline, from Safaniya to Ras Tanura, and other related facilities were 50 per cent complete at the end of the year. The Company estimates that, initially, these facilities should increase its capacity to produce and deliver crude by 50,000 barrels a day. Further additions, scheduled for completion in 1957, are estimated to permit production up to 125,000 barrels a day from Safaniya.

Marketing and Transportation

A total of 2,605,902 barrels of refined products was distributed by the Company, in Saudi Arabia, during 1956. This amount was an increase of 509,452 barrels over the previous year.

At the Ras Tanura terminal, 1653 tankers (105 fewer than the previous year) loaded crude, refined products, or bunker fuel. The south pier of the terminal was extended by 300 ft, so that most supertankers can now be accommodated there.

Personnel, Educational Facilities, and Housing

Of the Company's 19,632 employees in Saudi Arabia at the end of 1956, 13,213 (over 67 per cent) were Saudi Arabs, 2878 were Americans, and 3541 were of sixteen other nationalities.

Six schools operated throughout the year and two new primary schools were completed during the year. When two more schools, scheduled for future construction, are completed the Company's schools will have a total capacity of 2600 pupils.

A new permanent community was built at 'Udhailiyah in the Ghawar field and was ready for opening at the end of the year. The initial construction necessitated a large investment in industrial facilities and utilities, residential and related facilities, and the adjoining town site.

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"Archaic" Petroleum

"His Lordship did not believe that it made any difference that it was television rather than TV . . . This was an age when the corruption of words and their abbreviation was very common and his Lordship did not think that one person in 100 would use the correct word. The time might not be far distant when television would have as archaic a ring as petroleum did to-day." *The Times* (Law Report, 8 August, 1957), 9 August 1957, reporting a judgment of Salmon, J., in the Vacation Court.

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HYDROFINING OF BENZOLE

Newton Chambers & Co. Ltd, of Thorncliffe, near Sheffield, have concluded an agreement with the Coal Tar Research Association for the commercial development of the Association's process for the hydro-refining of crude benzole, naphthas, and other hydrocarbon oils.

This process is the result of research carried out by the Coal Tar Research Association since 1952 and employs pure hydrogen or hydrogen-containing gases, such as coal gas or coke oven gas in combination with a particular catalyst for the preferential hydrogenolysis of sulphur compounds, gum-forming olefins, and colour-forming bodies. The process also gives a substantially theoretical yield of refined products and has been developed for continuous and completely automatic operation.

An artist's impression of the plant for refining benzoles, naphthas, and so on, which is being built at Newton Chambers' Thorncliffe works.

The CTRA process employs a shorter contact time than other hydro-refining processes, thus giving a higher output for a given size of convertor. It also operates at lower pressures for naphtha refining, with consequent lower consumption of hydrogen in naphtha refining and a reduction in the conversion of aromatics to naphthenic hydrocarbons.

The choice of hydrogenating gas and the general operating conditions best suited for the desulphurization of a particular feedstock or range of feedstocks can at present be quickly ascertained in a small laboratory scale unit. In addition to these facilities, a 500-gal per day pilot plant has been erected at Newton Chambers' Thorncliffe works. This plant will be used to determine the optimum operating conditions and chemical engineering data, and will provide products in sufficient quantity for market research or further investigation by interested parties.

The pilot plant has been designed for wider operating conditions than those required for the hydro-desulphurization of benzoles and naphthas so that it can be readily adapted for further investigations and development work in this field.

Exhibitions, Conferences and Symposia

Symposium on "Safety in Chemical Industry"

The Chemical Engineering Group and London Section of the Society of Chemical Industry are holding a joint Symposium on "Safety in Chemical Industry" on 14 and 15 October, at the Royal Institution, Albemarle Street, London. Attendance at the Symposium is open to all interested persons on payment of the appropriate fee (members of the Society of Chemical Industry, 10s; non-members 42s) which will also cover the supply of a set of abstracts of the papers to be made available before the Symposium begins.

Full details and registration forms, which should be completed before 5 October, may be obtained from the Assistant Secretary, Society of Chemical Industry, 14 Belgrave Square, London, S.W.1.

IP/ASTM Conference on Mass Spectrometry

The Mass Spectrometry Panel of the IP Hydrocarbon Research Group will collaborate with Committee E-14 of the American Society for Testing Materials in a conference now being planned to take place in London during September 1958. Sessions will be devoted to the following topics: high resolution mass spectrometry, new instruments and techniques, the mass spectrometry of solids, mass spectrometry as applied to fundamental problems in physics and chemistry. Further details will be announced later.

National Anti-corrosion Week

The Corrosion Exhibition, which will be held at the Royal Horticultural Society's Old Hall from 15-17 October, will be opened by Harmar Nichols, M.P. Latest advances in anti-corrosion equipment will be displayed at the Exhibition by more than fifty firms.

A Corrosion Convention will also be held on 15 and 16 October, and delegates are expected from most of the large industrial organizations in the U.K. and from many countries abroad.

During National Anti-corrosion Week (14-19 October) it is planned that lectures on corrosion prevention will be delivered in provincial centres as well as in London. Enquiries concerning the activities of National Anti-corrosion Week should be sent to *Corrosion Technology*, Stratford House, Eden Street, London, N.W.1.

West Ham Chemical Engineering Sandwich Course

Early in July, Lord Hailsham, Minister of Education, urged industrialists to revise apprentice schemes and recruitment policies to cope with the coming increased flow of school leavers.

The West Ham Sandwich Course in Chemical Engineering was established with twelve students as a works-based scheme in 1957. The first complete session has been completed and has proved attractive to both industry and student alike, carrying as it does, exemption from the Associate-Membership examinations of the Institution of Chemical Engineers. Wide publicity has made it possible to place a sufficient number in industry to run two groups in the present session; one commenced in September, and the second will start in March 1958.

However, the Principal of the West Ham College of Technology reports that considerable resistance to a works-based scheme has been encountered, and present indications are that several likely applicants who could easily be accommodated at the College will have to be rejected for lack of sponsoring firms.

There appears to be no single reason, he says, for the apparent apathy on the part of industry. In some cases the new sandwich course conflicts with existing apprentice schemes; in others a works-based course is unacceptable; and yet, on every hand there is evidence of a grave shortage of chemical engineers for some years to come.

Industrial Carbon and Graphite Conference

The Society of Chemical Industry is to hold a three-day Conference on Industrial Carbon and Graphite at the William Beveridge Hall, London University, London, W.C.1, 24-26 September. Considerable interest has been shown in this Conference by various countries, including the U.S.A., Russia, France, and the Netherlands, and more than fifty papers have been submitted. Carbon and graphite provide a wide and important field of study, especially in nuclear energy and electrical applications.

Various governmental departments in Britain and from overseas countries have submitted communications, representing up-to-date research findings. Industry is well represented by applicational papers, while the subject of graphite manufacture is also dealt with by American and French teams, Britain being represented by the Atomic Energy Research Establishment, Harwell.

To provide time for adequate discussion, the papers will be summarized in selected groups, all papers being available in full as preprints. It is expected that this arrangement will enable the fullest information to be obtained in the three days of the Conference.

Prior registration for membership of the Conference is necessary (£4 for non-members of the Society of Chemical Industry), and application forms can be obtained from the Assistant Secretary, Society of Chemical Industry, 14 Belgrave Square, London, S.W.1, or from the Hon. Secretary of the Conference Committee, E. A. Smith, Acheson Industries (Europe) Ltd, 18 Pall Mall, London, S.W.1. Membership of the Conference includes a set of preprints of the papers.

A free exhibition of carbon and graphite will be held in the Department of Chemical Engineering, University College, Gower Street, London, W.C.1, during the period of the Conference. A cocktail party will also be held at 6 p.m. on 23 September, by invitation only.

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THE NEW HEADQUARTERS

Work on the rehabilitation of the Institute's new headquarters at 61 New Cavendish Street, London, W.1. is proceeding at a steady rate and members will be pleased to learn that the building will soon be ready for occupation.

Arrangements have been made for the Rt. Hon. Lord Mills, K.B.E., Minister of Power, formally to open the premises on 28 November. As the space for this formal function is very limited, admission to the ceremony will be by invitation only. Monday and Tuesday, 2 and 3 December have therefore been set aside as Open Days for the members to inspect the new headquarters, between the hours of 3 p.m. and 6 p.m. Tea will be served on both days. Members of the permanent staff will be pleased to show visitors around and it is hoped that a large number of members will come and see their new home.

Hydrocarbons from Petroleum

Dr. Rossini's talk to the IP

Dr F. D. Rossini delivering his address to members of the Institute of Petroleum.

On 9 July members of the IP were privileged to hear Dr F. D. Rossini address them on the subject of Hydrocarbons from Petroleum. The chair was taken by Dr E. B. Evans, a vice-president of the Institute, who said that in the field of hydrocarbon chemistry Dr Rossini would perhaps always be remembered for his association with the U.S. Bureau of Standards. For many years Dr. Rossini had worked there with Dr E. W. Washburn and it was there that the API projects which had become synonymous with Dr Rossini's name were started some 30 years ago.

In 1950 Dr Rossini was appointed Silliman Professor and Head of the Department of Chemistry at the Carnegie Institute at Pittsburgh. He was also Director of the Petroleum Research Laboratory, where API Projects No. 6 and No. 44 are handled. The Institute was very fortunate in having been able to take advantage of Dr Rossini's presence in Europe to persuade him to address its members.

At the dinner following the lecture the chair was taken by Lt-Col S. J. M. Auld, O.B.E. seen here (centre) *with* (left) *Dr Rossini and* (right) *C. S. Windebank, managing director of Esso Research Ltd.*

Dr Rossini, in opening his address, said he proposed to summarize the results to date of API Research Project No. 6 on the composition of petroleum, but first to outline some historical aspects of petroleum in the United States.

There were records to show that man used asphalt as early as 3800 B.C. and in various forms and in limited amounts it had been found in many countries. In 1853 Professor Benjamin Silliman of Yale was asked to examine a sample of "petroleum or rock oil" from north western Pennsylvania. He submitted a detailed report on the results of his examination of the oil. The report for which he received exactly $526·08 and which was published in April 1855, concludes: "there is much ground for encouragement in the belief that your company (The Pennsylvania Rock Oil Company of New York) have in their possession a raw material from which by a simple and not expensive process, that is distillation, they may manufacture valuable products".

Subsequent to the first world war the U.S. petroleum industry became seriously concerned about the composition of crude petroleum and in 1925, through the API, embarked on a programme of fundamental research on the origin, recovery, composition, and properties of petroleum. Among the projects established at that time was Project No. 6 and it was about this that Dr Rossini said he proposed to talk. He first illustrated the growth of production in the United States and also the growth of reserves and showed a photograph of the site in Memphis, Oklahoma, where the well was drilled from which, in 1927, 500 gallons of crude petroleum was extracted and on which Project No. 6 had been working continuously ever since.

One of the main lines of investigation of the project was to develop and operate fractionating processes which would produce samples of high purity for the purpose of ascertaining the physical properties of the hydrocarbons.

Also at the dinner were: Prof. S. F. Dainton (School of Chemistry, University of Leeds), Dr S. F. Birch (British Petroleum Co. Ltd), W. J. Murphy (Editorial Director, American Chemical Society)—

Referring to a photograph of the distillation laboratory at the Carnegie Institute, Dr Rossini pointed out that all their operations were necessarily slow. For the distillation of a charge of 5 litres with a reflux ratio of 200 to 1, the average take-off rate would be about 5 ml per hour, and a total period of 1000 hours would be required for that particular charge.

Up to the end of June 1957 they had, over a period of some years, isolated 159 hydrocarbons from their representative crude petroleum and he submitted a schedule giving details of these hydrocarbons. This showed that they varied from CH_4 (methane) to $C_{24}H_{50}$ (*n*-tetracosane). Various slides were shown illustrating the classification of these hydrocarbons into groups normally found in gasoline, kerosine, gas oil, and heavy gas oil fractions.

Answering the question that, having done so much work on one petroleum, what was the relation of this to all the other petroleums in the world, Dr Rossini said that nearly 20 years ago the Advisory Committee on this work had asked that same question. It had then been agreed that the gasoline fraction from several representative petroleums should be examined and, if possible, some conclusions drawn about the relation of the composition of these fractions to those obtained from the reference material. The results of this investigation were illustrated by further slides and Dr Rossini indicated that the conclusions reached showed that the compounds in the gasoline fractions could be placed into five main classes. They had not found any petroleum that contained hydrocarbons not contained in any other, the only difference being in the amounts. It was the amounts of these five classes which distinguished the different gasoline fractions and the important conclusion was that in each class individual compounds were present in amounts of about the same relative magnitude irrespective of which petroleum the class came from.

Following Dr Rossini's address a number of questions were asked by the audience and an interesting discussion followed. It is hoped that Dr Rossini's lecture and a report of the discussion will be published by the Institute in due course.

Dr Rossini Entertained

Following the delivery of his address to the Institute, Dr Rossini was entertained at dinner by Esso Research Ltd, the chair being taken by Lt-Col S. J. M. Auld, a past-president of the IP. Among those present were members of the Council of the Institute, members of the IP Hydrocarbon Research Committee, and representatives from various universities.

Following the dinner Colonel Auld made a short speech in which he expressed the pleasure it was to meet and exchange thoughts with our American confrères, whether it be in America or in the U.K. The Institute of Petroleum, he said, had been honoured by being addressed by Dr Rossini. He paid a tribute to Dr Rossini's work in furthering the study of the thermodynamics and chemistry of petroleum.

Dr Rossini, in reply, spoke of the pleasure he had had in speaking to the Institute and expressed his thanks for being invited to do so. T. Dewhurst, a past-president of the Institute said he had listened in admiration to Dr Rossini's address and Professor A. R. Ubbelohde said they should all be grateful to Esso Research Ltd, for the part they had played in arranging Dr Rossini's visit to England. In reply C. S. Windebank, managing director of Esso Research Ltd, expressed his Company's pleasure at being hosts to the guests present that evening and his thanks to the Institute of Petroleum for having arranged the technical meeting.

—and Dr W. J. Hickinbottom (Queen Mary College, University of London), Dr F. D. Rossini, Prof. E. E. Turner (Bedford College, University of London).

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MIDDLE EAST PRODUCTION

Tons

	June	*Jan.-June*
Iraq Petroleum Co. Ltd ...	934,528	3,625,918
Basrah Petroleum Co. Ltd ...	737,131	4,198,149
Mosul Petroleum Co. Ltd ...	54,097	159,080
Qatar Petroleum Co. Ltd ...	560,580	2,913,630
Iraanse Aardolie Exploratie en Productie Mij	2,922,000	16,471,000
Kuwait Oil Co. Ltd	—	25,235,863

The refinery throughput at Abadan of the Iraanse Aardolie Raffinage Mij for June was 1,180,000 tons, the total for 1957 being 8,016,000 tons.

Petroleum in Parliament

Somaliland Exploration Licences

In a written reply on 2 July, the Under-Secretary of State for the Colonies said that the Government of the Somaliland Protectorate had granted licences to Conoco Somal Ltd which follow generally the lines of the Colonial model licences, and it was expected that similar licences would be granted shortly to the Standard-Vacuum Oil Company.

Construction Loans for Tankers

On 2 July, the Chancellor of the Exchequer said that since he had requested the Capital Issues Committee to restrict long-term bank loans on 9 April, the Committee had received one proposal to finance the construction of a single tanker by loans from the clearing banks but this had been rejected.

Government Holdings

On 2 July, the Chancellor of the Exchequer said that Government holdings of shares in public companies included the following: Suez Canal Company, 353,504 shares; British Petroleum Co. Ltd, £6,250,000 Ordinary Stock and £1000 Preference Stock.

Hydrocarbon Oils Duty

In a written reply on 3 July, the Financial Secretary to the Treasury gave the following details of the amount of light and heavy hydrocarbon oils retained for home consumption during the year ended 31 March 1957 and the net amount received in respect of duty thereon:—

Class	*Quantity*	*Receipts of Duty*
	Gallons	£
Oils chargeable with Customs Duty		
Light oils	1,963,556,035	267,661,306
Of which motor (including aviation) spirit	(1,913,241,864)	(260,555,772)
Heavy oils:		
For use as road fuel ...	447,802,826	62,319,034
Other (mainly lubricating oils)	165,705,488	690,439
Oils chargeable with Excise Duty		
Light oils	121,142,550	9,121,807
Of which motor (including aviation) spirit	(73,316,246)	(5,340,862)
Heavy oils for use as road fuel	22,228,428	1,738,290
Total	—	341,530,876
Allowance on certain home produced oils used in approved refineries as raw material for chemical synthesis	—	3,617,961
Net total	—	337,912,915

N.B.—These particulars relate to oil subject to a net liability to Customs or Excise Duty; comparable figures are not available in respect of heavy oils for which the duty is wholly rebated.

Diesel Oil Duty

In a written reply on 9 July, the Chancellor of the Exchequer said that the estimate of the total cost to the Revenue of exempting diesel oil used for road transport from the duty on hydrocarbon oils and of exempting from duty diesel oil used in public service vehicles would be about £63 million and £30 million, respectively, in the first full year.

Industrial Fuel Oil and Coke Prices

On 15 July, the Paymaster-General said that the increase in the price of industrial fuel oil between 1947 and the recent ending of rationing was 5¼d per gallon, or 65 per cent wholesale, and that the price of domestic coke had increased by 5s 6d a cwt, or 130 per cent retail, since 1947.

In reply to a further question he said that on the average, the retail price of coal had risen since 1947 by over 100 per cent, which must be one of the highest items in the Cost of Living Index.

Persian Gulf Exploration

In a written reply on 29 July, the Secretary of State for Foreign Affairs said that the exploitation of Persian Gulf oil was governed by agreements freely contracted by international oil companies with the Government concerned. These agreements provided for an equal share of profits between Government and oil company in each case.

Continuing, he said that the Government was in close contact with the countries of the Commonwealth and with our Allies on all matters relating to the maintenance of peace in the area. H.M. Government, he said, had no direct responsibility for the internal affairs of the Persian Gulf States but was constantly searching for ways of maintaining the political stability of the area, and of assisting in promoting the welfare of its peoples.

British Oil Interests in Israel

In a written reply on 29 July, the Secretary of State for Foreign Affairs said that it was not Government policy to restrict the operation of British oil companies in any country. It was, however, Government policy, since it acquired in 1914 the majority shareholding in the then Anglo-Persian Oil Company, not to interfere with the commercial decisions of that company. He said he should add that H.M. Government had no prior knowledge whatever of the recent decision announced by the Shell Oil Company to seek to dispose of their marketing interests in Israel, which they own jointly with The British Petroleum Company.

In a written reply on 1 August, the Minister of State for Foreign Affairs said that subsequent to the announcement of the oil companies' decision, the Secretary of State for Foreign Affairs had discussions with directors of both BP and Shell and that he was left in no doubt that their decision was a commercial one.

He also said that H.M. Government held shares in a variety of companies, and even where H.M. Government held a controlling interest, it has long been established policy that H.M. Government do not interfere in the purely commercial decisions of such companies. Where strategic issues are clearly involved, he said, H.M. Government would expect to be consulted.

Hong Kong Duties

In a written reply on 2 August, the Secretary of State for the Colonies said that the import duty on hydrocarbon oils levied in Hong Kong in the year 1955-6 was $HK 22,051,407·03.

*The Place of Automatic Equipment in Marketing Operations**

By JULIUS CAESAR†

In planning for the future it is necessary to acknowledge that both labour standards and the cost of labour are likely to increase. Accordingly, urgent consideration must be given to the further development of automatic processes and techniques. The purpose of this paper is to endeavour to establish briefly to what extent there exists a scope for the introduction of mechanical and automatic devices in the marketing operations aspect of the petroleum industry, and to consider the advances which have already been made.

Scope for Automation in Marketing Operations

The introduction of any simple mechanical device or a complicated piece of automatic equipment must, to a certain extent, depend upon the degree of pay-out which can be shown on the capital investment. This in turn is conditioned by the expected volume of throughput. Naturally, therefore, there is a greater attraction towards the use of relatively expensive automatic processes in a modern oil refinery, compared with the various stages in the distribution network. The industry is now passing through a redeployment phase whereby larger, well-planned storage centres, capable of feeding a relatively wide area, are replacing the untidy pattern of numerous depots which existed at the demerge of the Petroleum Board. Here then is the industry's chance. The larger throughput planned for the new depots provides a stimulus for introducing up-to-date mechanical methods and a pay-out should be reasonably assured.

Considerable progress has already been achieved in the field of marketing operations. Many products are now measured and packed by automatic processes, and electronic machines have been evolved for their electronic sorting and automatic stacking. A great saving in manpower has thereby been achieved. In the movement of packaged products, substantial improvements have been effected in the petroleum industry (and in many others) by the introduction of palletization combined with the extensive use of fork lift trucks. In this relatively simple development, considerable economies have been effected in the use of labour, the more efficient use of warehouse storage capacity has been made possible, and the reduction to damage to packages during the handling process has been quite substantial. The benefits thus derived are, without doubt, true justification for the additional capital expenditure.

In the movement and storage of bulk supplies, there is undoubtedly ample scope for improving the present antiquated methods by installing modern automatic equipment. This will assist in coping with the expected future increased load, which will inevitably be placed upon the industry, without recourse to a terrific increase in its labour force. In this field, inevitably, the mechanical processes tend to become more complex, and, indeed, in certain instances extend to the realm of automation.

The term "Automatic Equipment" refers to specific pieces of apparatus forming part of a production plant designed to improve the economics of handling or manufacture. A broader conception of automation can be applied to the entire method of handling or manufacture and in the case of oil to its distribution. Any procedure designed to reduce the amount of handling or transhipment falls in this category. If, for example, pipelines can be substituted for vehicle or road handling, then a very considerable amount of automation has been achieved.

Storage

Automatic equipment can be employed to considerable advantage in the storage of petroleum products, and manufacturers in the oil industry are meeting the need for it. Routine day-to-day tank dipping and the operations of tank valves in a large tank farm demand labour which can be substituted by automatic methods. More often than not this work has to be carried out in exposed climatic conditions and has nothing to counter the attractions of other forms of employment. In addition, with those products which are subject to a build-up of static electricity, the reduction of manual dipping and metallic tape contacts at the dip hatches is a distinct advantage from the safety point of view.

Storage tanks are now being fitted with mechanical gauges so that the liquid level may be read at the base of the tank. This arrangement is an improvement on the use of a dip-tape but is not new, and where tanks are spread out over a large area some form of remote reading indicator, at a central control point, is desirable.

Various systems have been evolved for this purpose but the use of low-voltage transmitters and receivers has many advantages. The Desynn system (Fig 1), for example, operates with a 24-volt d.c. supply, and comprises a transmitter on the tank gauge and an indicator on the control panel. Any angular movement imparted by the tape to the shaft of the transmitter causes positive and negative brushes to rotate. The resultant field causes the stator winding in the receiver—or indicator—to rotate in synchronism with the transmitter brushes. A selector switch at the central point can be arranged so that the readings of any number of tanks may be taken on the same dial.

*Read to IP Economics and Operations Group on 18 December 1956.

†Mobil Oil Co. Ltd.

This system has recently been incorporated in a new fuel oil installation in the U.K. Further refinements have been added to it to assist in the automatic selection of tankage when feeding products in through a common delivery line. The capacity of the line, which is approximately 8000 ft long, has been accurately calibrated and is related to a depth of 3 ft 10 inches in the terminal storage tanks. A variable high-level alarm has been incorporated in the remote-reading tank-gauge system (Fig 2). This operates in such a way that the gauges can be preset to read any level required in the tank and to energize the alarm system as soon as the contents of the tank reach that point. The transfer of different blends of fuel oil through the common line is facilitated through the medium of the preset gauges on the receiving tank, which automatically record the arrival of the interface at the terminal manifold. Pumping is continuous and is of such a rate as to ensure a turbulent flow in the line and a minimum of admixture at the interface.

The high-level preset is operated by rotating the stators of two Desynn receivers, one for feet and the other for inches, so that their rotors are carried away from the lining up, or zero, position by an amount proportional to the liquid level required. As the liquid in the tank approaches this level, the transmitter is rotated and the receiver rotors follow in synchronism until they move back to the lining up, or zero, position. In this position, a ray of light from an exciter lamp passes through slots in disks carried by the rotors of the receiver to a photo-transitor, thus energizing relays to operate the warning device.

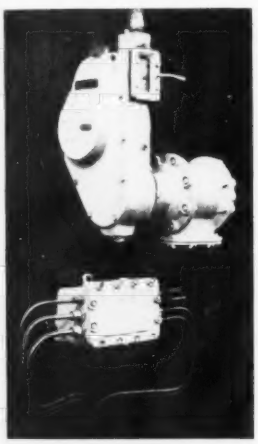


Fig 1. *A Desynn transmitter fitted to the external ground level gauge. The relay box receiving the signal from a second tank is also shown.*

The rapid change from one tank to another in this particular system is achieved by the employment of remote-controlled, power-operated valves (Fig 3). One valve serves each tank from the manifold at the end of the common delivery main. They operate over an interval of 2½ seconds through the use of compressed air but control of the air valve is actuated electrically from the operator's desk. Electrical interlocks prevent the closing of one valve unless another is open.

"Automation" could be carried further from this stage by causing the high-level relay to operate valves and pumping machinery. To add further refinements there is no reason why manual operation of the pumps at the delivery end of the line should not be substituted by automatic equipment remotely controlled at the receiving point. By a similar system of power-operated valves on the suction lines to this pump,

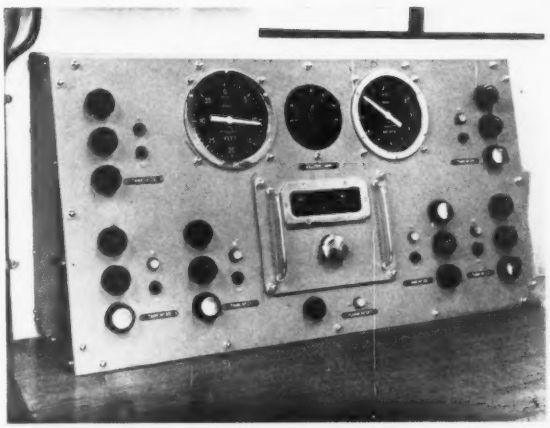


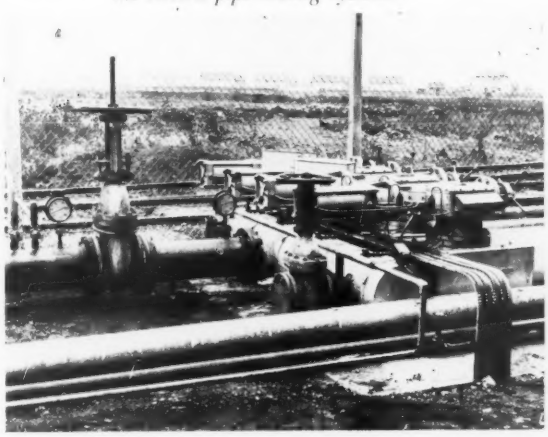
Fig 2. *The operator's panel controlling receipt of product from the refinery. The level in Tank* 23 *is indicated, the tank selector switch being in the top centre. Bottom centre is the adjustable level gauge. Push buttons operate the remote-controlled tank valves, whose operating position is indicated by coloured lights.*

control of supplies to the terminal could be vested in the hands of one man. Furthermore, the contents of the main-feed storage tanks holding a reservoir of the relevant grades could also be recorded at his desk by the remote reading gauge system.

Blending

Considerable development has been made in the blending of finished products from a given combination of stock oils. By the use of positive displacement pumps, having an adjustable flow, and by running two or more of these pumps by a common prime mover, thereby achieving a constant relative speed, a predetermined blend may be achieved. Having fixed the desired proportion, the rate of flow through the pumps can be changed by manual alteration of a master dial

Fig 3. *The remote-controlled valves at the end of the refinery multi-fuel delivery line. The electrically operated valve controlling the compressed air supply can be seen fitted to the right-hand valve. Also shown is the thermostat controlling the electric pipe-heating system.*



varying the capacity of the pumps by means of a gear linkage.

The use of such a system attains a considerable degree of automatic control and is suitable for blending products at a uniform rate. Its limitations, however, are apparent, since for loading purposes at the terminal a variable rate of flow is required and for the less-viscous or light fuels the use of centrifugal pumps is the normal practice. However, the great saving in storage capacity, whereby field tanks can be limited to a small number of stock blends, justifies such an installation, provided these difficulties can be overcome.

A refinement to the proportionating pump delivering a preselected blend has recently been introduced by American manufacturers to meet these requirements of the loading rack. Using centrifugal pumps the system is made flow responsive to variations of filling rate without need for any manual adjustment. The machine operates through the employment of meters, the original proportion of each of the stock oils having been set on the registration dial of the instrument. In essence, the flow of the major stock product is uncontrolled, the quantity varying with the filling demand. A meter on the blended product line to the loading bank operates a variable flow valve in the minor or controlled stock product line (Fig 4), depending on the reading of a second meter in that line. A meter on this controlled product line is geared and automatically locked in synchronism with that recording the finished blend.

Irrespective of savings in storage tank capacity for several grades, an economy in pumping capacity is also achieved since, if supplies of various grades at the loading bank are spasmodic, the controlled product may be diverted direct to the bank without interference with the blending machine, but using the same pump.

Filling Operations

The place for automatic equipment in marketing operations is primarily in those places where product handling is more laborious, namely at those points where comparatively unskilled labour is needed to undertake an operation involving a considerable period of time. If such an operation involves the use of power, then economy is achieved by the restriction of that labour and its more efficient employment, by an effective control of the power used, and by a speeding up of the operation within the limits of safety.

Such a situation exists at the vehicle loading bay of any bulk installation or depot. Up to quite recently, the loading of tank wagons by gravity was the established practice in the industry. This was a tedious and lengthy operation, and the protracted standing time at the filling bays seriously impaired the efficiency of vehicle operation. Indeed, the difference between two and three journeys per shift may well have been involved. Only in the post-war years has the operation been examined, and the revision of the Home Office regulations regarding the filling of petroleum vehicles did much to improve the situation. Open vehicle manholes and free discharge through submerged loading arms, with pumped delivery to the vehicle, have reduced the net filling time considerably. The labour involved in making and disconnecting the earlier type of screwed hose coupling has also been reduced. On a large vehicle this total reduction can amount to as much as 20 minutes. Higher filling rates and larger discharge lines are the logical development, but the fact remains that unless some form of control is placed on the operation, the loaders cannot handle it efficiently.

The two most important points where such control is necessary are the measurement of product into the vehicle and control of the use of power operating the pumping system. The small amount of time needed under a high-speed filling system to fill a 600- or 800-gallon vehicle compartment makes it difficult to gauge the contents accurately by dip to a predetermined quantity. On the other hand, when manual control of pumps is employed there is a tendency to leave the pumps running between filling operations, leading to an unnecessarily high rate of power consumption; this is especially the case if control is at the pump bay itself.

Automatic equipment can meet the need for measurement in the form of meters. There are, of course, certain places where the meter has no substitute, such as in pipeline operations, but although the chief function of a meter is to measure accurately the quantity of liquid passing through it, it does eliminate many of the operations necessary at the point where vehicles and rail cars are filled and discharged. With an accuracy of plus or minus one part in one thousand over the greater part of its designed flow rate, losses applicable to measurement against a dipping stick are reduced. Preset mechanisms and ticket printing devices are now standard fittings to most types of meter and these provide documentary evidence as to the quantity passing without recourse to the human failings in gauge reading and booking.

Further adaptation of the use of meters at the terminal loading racks has been made by the use of remote-reading counter heads. This is done by the use of Selsynn or Desynn motors which repeat the meter reading at a control counter. Operation of the loading bank is thereby confined to the despatch clerk, whose job it is to allocate a loading position to the driver on his entry to the terminal and to tender to him his completed documents on leaving. Preset mechanism on the meters eliminate all counter watching. By this method, any withdrawal of product from the system can be prohibited until interlocks operated by the despatch clerk release the electrical pumping circuits.

Pumping Arrangements

Gravitational systems of loading can no longer meet the increased filling rates and quantities required, unless a considerable head can be achieved by the skilful use of topographical layout. It is usual under this method to transfer product to high-level service tanks during a convenient part of the working day and to feed therefrom to the vehicles as

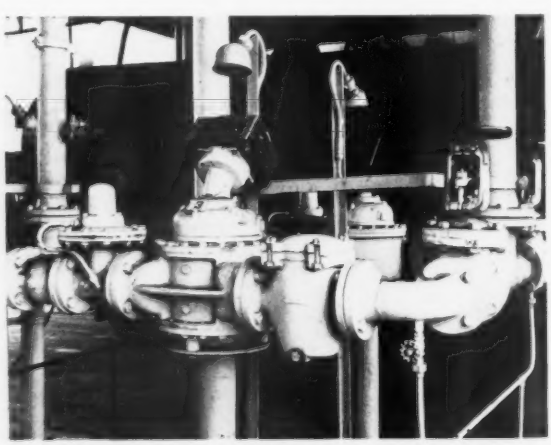


Fig 4. A 3-inch dia positive displacement meter, complete with strainer and flow control valve, installed on a vehicle filling bank.

and when required. With pumps feeding the loading arms direct, one transfer of product between the storage tanks and the vehicles will take the place of two, thereby saving some displacement loss. But some form of intermittent starting and stopping of the pumps, short of constant attendance at the pump bay, must be provided. Start and stop buttons at the loading position provide additional duties and responsibility for either loaders or drivers. More often than not, a climb to the top of the vehicle or some other movement involving time is needed after starting the motors, and human nature is such that the motors are left running after the filling operation is complete. It is found under test that up to 20 per cent additional power is consumed thereby, compared with a system incorporating automatic control of the pumps.

If the pumps are operated by automatic means, no pump attendants are needed and no related operations concerned with them are necessary at the point of loading. Automatic control of pumps is not new, but its adaptation to marketing operations constitutes an advance towards economy in manpower and electricity consumption. Two systems used successfully in the U.K. are worthy of note, one operating under a sudden change in flow conditions in the lines and the other by a differential in pressure. In both cases, the demand for product indicated by operation of the loading valve transmits the necessary impulse to the pump motor starters.

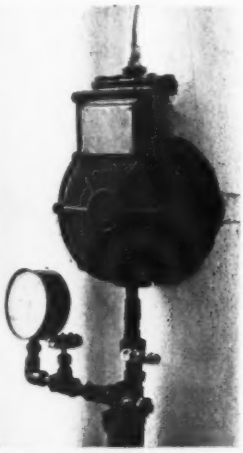


Fig 5. The mercury pressure switch actuating an electrical relay on a differential pressure developing in the product lines.

One installation in the central London area, where petrol storage regulations are very stringent, has the storage tanks underground with the loading racks above them and is designed for the storage of two main products. Deep-well pumps, each large enough to feed two loading points, are actuated by a flow control system. Header tanks are provided to maintain a flow in the line. As soon as any one of the loading valves is opened the pressure in the delivery pipe is released and flow takes place from the header tank. When this flow exceeds 3 g.p.m., it is detected by a flow controller having its orifice in the header tank line and the pump on first duty starts operation. Operation of a second loading valve on the same product line increases the flow to 520 g.p.m. Beyond this point, when a third loading position is brought into operation, a second flow controller will bring in a second pump, capable of supplying the third and fourth loading positions. Under average loading conditions not more than two loading valves are opened for any one product at the same time. It is therefore unnecessary to install large pumps suitable for the maximum demand, but rather to bring in a second smaller pump when needed. By a system of suitable time delays, any inconvenience due to the pumps shutting down when the loader is changing from one compartment of his vehicle to another is avoided.

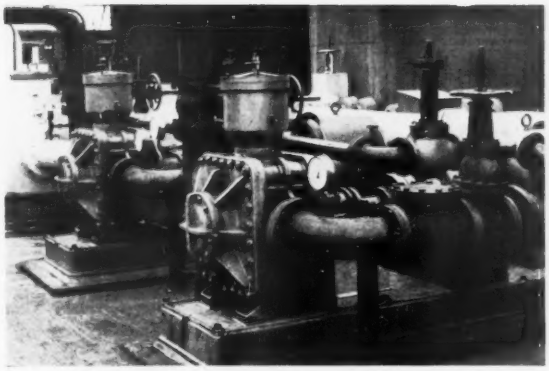


Fig 6. Constant pressure-control pumps delivering 600 g.p.m. and operating under automatic sequential starting at a recently completed fuel oil terminal.

A series of switches permitting hand operation is provided for emergency purposes, but the system is entirely automatic and needs only regular maintenance of electrical and mechanical equipment.

At another terminal the throughput is greater and the pattern of loading is such that more pronounced peak periods occur during the day. Here the storage tanks are above ground and three centrifugal pumps, each delivering 500 g.p.m., are coupled automatically so that each serves two loading points out of a total of six. The star-delta starters are actuated by a relay from a mercury pressure switch (Fig 5) situated on the loading island, and the duty sequence of the pumps may be altered by change of selector switch on the control panel. The product delivery lines are held under a pressure of 80 psi. Relief of pressure by opening the loading valves creates a differential across the pressure switch, thereby closing the required pump circuit. Pump No. 1 will feed loading points 1 and 2. Opening of loading point 3 creates an overload condition on the pump which, after a 10-sec delay, excites pump No. 2 through a moving coil relay on the starter panel. This delay is inserted to exclude the effect of spasmodic starting or coincidental closure of the other loading points. Similarly, pump No. 3 is brought into use if five or more loading positions are operated simultaneously. The closing down procedure takes place in the reverse sequence and is independent of the order in which valve closure takes place.

The system has been installed where employment of labour is difficult. It does, of course, require maintenance but no more than does any manually operated system. The tendency at the present time, where technical maintenance men are employed, is to confine their activities to regular hours of daytime working, leaving a checker on duty for night work and early morning peak periods. The automatic loading system is always available and ready to operate should loading take place. The object has been to achieve a balance between high-speed loading through several points simultaneously at peak throughput, and yet to restrict electric power consumption by splitting the motive units into economical sections suitable for average and light duties.

With heavy fuel oils and the inherent problems of viscosity and positive displacement pumps further modifications must

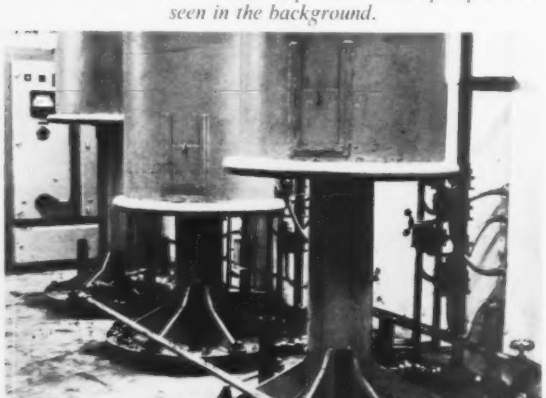
be made, although the general principles of sequential motor starting can be employed. One recently constructed installation incorporates pumps which deliver to the loading arms—again in pairs—at a rate of 600 g.p.m. (Fig 6). These pumps operate under a constant pressure control, the centre block of the pump sliding vertically to provide increased capacity through the pump on a change of pressure. The standard system of automatic or "Constant Pressure" control fitted to these pumps has been adapted to form a combined sequential switch system for three pumps, depending upon the demand for product at the loading bank. Normally, the sliding block of the pump is raised or lowered to meet the demand by means of a piston connected to the block, against which a constant pressure is maintained by a weighted accumulator fitted on the pump's base plate (Fig 7). Two or more of the pumps are connected hydraulically to a common accumulator, the vertical movement of which operates limit switches relaying to the starter mechanism. Again no operation is needed by the loader, since release of pressure by opening a valve causes a drop in pressure in the line and through the pump. This causes the accumulator to drop, thereby actuating the pump electrically and bringing in or shutting out, as the case may be, additional pumps in its upward or downward movement.

Delivery to Customers

There are different points of view as to the reaction of customers receiving petroleum products through a meter on the delivery wagon (Fig 8). It is not the purpose of this paper to weigh one against another, but it is found from experience that the reduction of manual operations in the delivery procedure because of the automatic equipment increases the confidence of the customer towards the supplier. The former is assured of an accurate quantity entering his tanks and receives a printed ticket showing the precise amount delivered. The goodwill towards the latter is maintained by a constant attention to the equipment and regular testing and calibration procedures.

The advantage of such a delivery system is not so apparent where complete loads are dropped into single tanks, but the large majority of customers are not equipped to receive product under such conditions. Under the present regulations for delivery of petroleum products, the use of meters is as near to an automatic system of direct supply to a customer as has been achieved.

Fig 7. Accumulators, one for each product system, controlling the pressure on the sliding block of the delivery pumps. Relay switches to the starters actuated by vertical movement of the accumulator as it moves to retain pressure on the pump can be seen in the background.



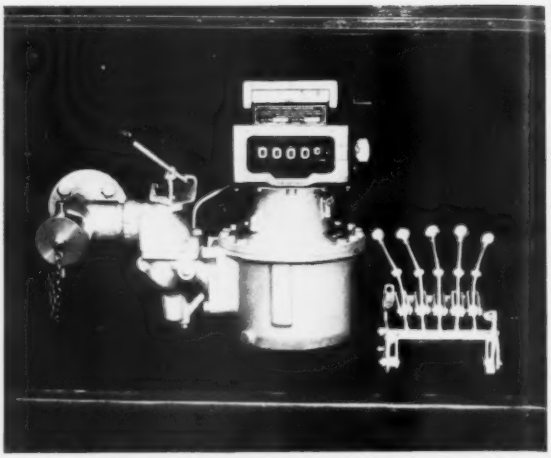


Fig 8. Meter with ticket printer shown fitted to delivery vehicle.

It should be borne in mind that with metered delivery to customers the transport vehicle is sealed. The driver has no means of withdrawing his load other than through the meter. Whether or not the meter is fitted with a preset mechanism, only that quantity passing through it is printed on the delivery ticket. Modifications to existing regulations could widen the field for "absentee" deliveries enabling suppliers to replenish customers' tanks during off-duty hours, thereby permitting a combined system of automatic equipment to cut down overall delivery costs. But although this practice has been developed in one or two countries there are many problems which would have to be overcome before it were accepted, or permitted, in the United Kingdom.

Conclusion

Much has been read in the national and technical press recently of the effects of automation on labour relations and employment. The general impression in uninformed circles seems to be that the introduction of automatic equipment will eventually deprive the working man of his means of livelihood. This, of course, is not the case and when considering the problem fully a balance should be drawn between the present conditions of labour, and the need of industry for an ever-increasing number of skilled technicians having a higher average standard of education than two decades ago.

The introduction of automatic equipment in any industry is designed to improve the standard of the product and its handling, to create more uniformity in handling, and to speed up the throughput beyond the point where manual operation can meet the demand. In an expanding industry, such as oil and chemicals, the main function of automatic equipment is to take the place of labour which is unobtainable rather than to replace men already employed. Of course, it has the object of partly eliminating the human element, mainly where the less attractive routine operations are concerned, but in the long-term view it does not create unemployment. It has the effect of changing the type of labour required and placing more skill and responsibility in the hands of those men so employed.

Discussion

Asked by E. C. Scorgie how accurate the proportionary equipment would be when used with fuel oil blends, the author said that he understood that the accuracy was very high and was improved over manual use by the removal of the registration load and substitution of motor-driven mechanisms. On volumetric deliveries a guarantee of plus or minus 0·5 per cent was given which meant that viscosities of the finished blend would be within the limits of determination by the standard viscometer.

On the question of the blending of lubricating oil by this equipment, Mr Caesar said that positive displacement meters gave high accuracy and long service, and although troubles had been experienced with temperature, compensation mechanisms were now fitted to blending machines.

Use of Radioactive Isotopes

Mr Caesar raised the point as to the use of radioactive isotopes when transporting various grades through one pipeline. He asked whether any difficulties had been experienced in regard to the handling of the isotopes and the disposal of contaminated materials. A. H. Stephenson said that no difficulty had been found in detection at the receiving end, and Geiger counter readings had produced an accurate representative curve of the mixing at the interface. His Company had used this method when other methods of detection were difficult and had experienced no particular technical difficulties. As regards the risk involved in using isotopes this had been overcome by employing an isotope with a very short half-life.

In-line Blending and Use of Meters

In regard to in-line blending Mr Stephenson said that the question of satisfactory blends of fuel oils or of lubricating oils was not a question of percentages, but of the different temperatures and varying gravities throughout the tank. The criterion for accuracy was in the final viscosity of the blend itself. He asked the author whether, in regard to lubricating oil blending in the proportioneering plant, the accuracy obtained was sufficient to enable the product to be put directly on to the market or whether it had to be put into a test tank before release. If the latter method was adopted, he wished to know what tests were used or what tests would be recommended for a product being delivered direct from the proportioneering equipment into a road wagon or into barrels. He was interested in the Desynn motor-driven devices for taking readings from storage tanks which, he said, only provided information in regard to the dip at one particular point. They had to obtain a water dip and measure the temperature, both of which were necessary for the majority of stock movements; intermediate stock movements of the difference between two dips could be recorded, but he thought that a lot of development in automatic dipping devices was necessary, particularly where authorities would not accept less than four readings for a tank. Mr Stephenson thought that an effective saving of labour would only be possible when instruments were available to give automatically the average dip of water and temperature readings.

In regard to the use of meters on vehicles, Mr Stephenson thought that in the normal trade in Britain it was a practice in most cases to deliver full compartment loads rather than split compartment loads. The question of emptying compartments raised the problem of air being registered by the meter and he had seen automatic devices for eliminating the air. These, however, did have the effect of stopping the flow until some air was exhausted and this process was repeated until all the product and no air had been delivered. He asked how this problem had been dealt with and whether it was the practice to leave the compartment always with some product in it. Mr Stephenson also referred to the use of vehicles for a number of products in which case the meter must contain some of the previous product. This involved draining operations when a change of grade occurred, and he asked how this problem had been overcome.

Mr Caesar said that in regard to the proportionating of lubricating oils the finished product was passed to storage tanks after testing. In regard to meters, each meter fitted to a vehicle had an air eliminator in conjunction with it. On the loading bank itself, the air eliminator was of considerable size depending upon the flow rate and should be located at the highest point of the line. It was not good practice, he said, to pass more than one grade of a product through a delivery meter, and he knew of a case where one company carried six meters for six different products on one delivery vehicle. As a compensation for the loss of pay load there was the ease with which delivery could be accomplished.

Control of Stock Losses

A. C. McGechan said that automatic equipment was likely to give more accurate measurement than manual methods and would enable stock losses to be controlled and reduced. On the tank itself automatic gauges enabled dipping to be eliminated, gave increased accuracy, and reduced losses of volatile products caused by dip hatches being opened. For some years, it had been the practice to fit new tankage with one dip hatch per tank only. In one case, the customs authorities had complained that one dip per tank could not give an accurate measurement. Automatic gauging of the type described measured only one liquid level and was therefore the same as one dip. He felt that except for delivery and inventory measurement it was sufficient to take the product liquid level. The only circumstances in which trouble might be experienced were when the tank bottom was liable to movement under liquid head, but he doubted whether taking dips at more than one point would give much greater accuracy. He considered that the metering of products on delivery to vehicles was a further step towards control and reduction of stock losses.

Automatic Control of Pumps

In regard to the automatic control of pumps working in parallel Mr McGechan asked the author's experience in this. His Company was interested in the application of automatic control to two centrifugal pumps working in parallel, but the makers were not happy that such an arrangement would be satisfactory.

Mr Caesar said that the automatic control system, as shown for fuel oils, was designed for a common accumulator controlling the pressure on all positive displacement in the system. If different sizes of pumps were used, separate accumulators for each would be necessary. He had not used varying sized pumps in such a system, nor in one using alternative types of pumps and automatic control. With centrifugal pumps, however, varying sizes may be used by controlling them from moving-coil contact relays operated by the flow rate condition of the pump. This system is described briefly in the paper. Care would be needed in the design of pipelines and suction conditions, but there appeared to be no advantage in dividing the load for delivery in vehicles other than into equal parts, for an average-size installation.

Tank Dipping and Temperature Recording

In regard to tank dipping, any number of dips could be made by fitting different gauges and also a selector switch. The tanks he had referred to were supported on foundations and no water bottom was held. Adequate stock control could be maintained under such conditions and separate dips, particularly for Customs purposes and stock control, were needed only where variable conditions occurred in the tank. Development was now taking place on automatic temperature recording in tanks.

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NEW DEEPWATER OIL TERMINAL FOR VENEZUELA: £30 MILLION PROJECT

A new deepwater oil terminal is planned at Punta Gorda, Venezuela. To be built by Shell, the terminal will be for the collection, storage, and shipping of crude oil produced from their fields on the east shore of Lake Maracaibo and in Lake Maracaibo itself. Punta Gorda is situated on the east coast of the entrance to the Lake, some nine miles north-east of the city of Maracaibo.

Estimated to cost some £30 million, the project will be completed in two years. The terminal, which will be fitted with the most modern control equipment, will have an initial throughput capacity of around 700,000 barrels per day with a storage capacity of 4 million barrels. The port will be able to handle supertankers and will be capable of future expansion if required.

Shell's crude oil production in the Lake Maracaibo area at present totals some 900,000 barrels per day—about one-third of Venezuela's current total production. It is intended that almost all of this shall be handled either through the Punta Gorda terminal or through the light oil pipeline running from Palmarejo, on the west coast of Lake Maracaibo some 11 miles north of Maracaibo, to Cardon refinery on Paraguana Peninsula.

World Tanker Fleet

Sun Oil Company's Analysis

The Sun Oil Company's *Analysis of World Tank Ship Fleet, December* 31, 1956, is the fifteenth in the series of reports first published for the U.S. National Petroleum Council. It is prepared under the direction of James S. Cross, manager of the Company's Statistical Research Department.

The report shows that at the end of 1956 the world fleet of ocean-going tankers of 2000 gross tons and over numbered 2778 ships of 44,882,600 dw tons. An outstanding feature of 1956 was the continued decline of the U.S. in respect to flag of registry to 18·9 per cent of world total and the rise of Liberia to 14·1 per cent. Details of ownership by countries extracted from the report are given in Table I.

At the end of 1956, 5·3 million dw tons of tankers were under construction in Japan, 4·2 million in the U.K., and 3·4 million in Sweden. The total under construction and on order at that date was 879 ships aggregating 25,488,000 dw tons.

The conclusion is drawn that important positional changes will take place among the major fleets of the world by the end of 1961. It is considered that the U.S. will decline to fourth place, with the U.K., Norway, and Liberia occupying the first three positions respectively.

Although tanker charter rates are highly sensitive to international incident and other conditions, it is suggested that, barring unforseeable occurrences, charter rates in the short run (one year) will be influenced primarily by the seasonal pattern of crude oil demand. In the long run, the more important factors determining charter rates will be product demand, growth in total tanker carrying capacity, changes in distances of tanker routes, and costs of alternative modes of transport.

Statistics of tanker charter rates are tabulated and graphed and details of the world tanker fleet are given in terms of speed, age, overall length, moulded beam, and draft.

TABLE I
World Tank Ship Fleet at 31 *December* 1956
(Ocean-going vessels of 2000 gross tons and over)

Flag	*No.*	*Actual dw tons*	T2-SE-A1 *Equivalents*	
			No.	*Per cent of world total*
United States				
Oil companies ...	226	3,956,500	244·6	9·4
non-oil companies ...	109	1,930,300	118·2	4·5
Government ...	142	2,005,900	130·6	5·0
	477	7,892,700	493·4	18·9
United Kingdom ...	538	7,722,500	420·0	16·1
Norway...	415	6,902,800	390·9	15·0
Liberia	250	5,850,600	369·8	14·1
Panama...	183	3,323,000	197·6	7·6
France	108	1,938,800	113·8	4·4
Italy	119	1,879,000	107·5	4·1
Sweden	92	1,537,600	89·7	3·4
Netherlands	120	1,542,700	85·5	3·3
Japan	71	1,210,800	70·9	2·7
WORLD TOTAL ...	2,778	44,882,600	2,614·2	100·0

U.K. Oil Imports

Effect of Suez Crisis on Half-Year Figures

The effects of the Suez crisis on the supply of petroleum and petroleum products to the United Kingdom are reflected in the figures for the first half of 1957 in comparison with the same period of 1956. As shown in the accompanying table, the effect of quantity was to reduce the total import from 5136·6 to 4740·5 million gallons, a decrease of about 8 per cent. This decrease in the total was more than accounted for in the reduction of imports of crude petroleum, which were 417·8 million gallons lower than in the first half of 1956.

For refined products, there were increases in motor spirit, 10·7 per cent; kerosine 4·8 per cent; gas oil 3·9 per cent; and diesel oil 19·4 per cent. Fuel oil imports were lower by 13·9 per cent and lubricating oil by 10·4 per cent.

The countries of consignment show quite considerable changes. In the periods under discussion, imports of petroleum, mostly crude petroleum, from the Middle East were 32 per cent lower, while those from the United States were nearly six-fold. Similarly, while in the first half of 1956 the Middle East supplied nearly 65 per cent of Britain's total oil requirements, the 1957 figure was only 47·5 per cent. From the United States, the quantity in 1956 was 3·2 per cent and in 1957 19·3 per cent.

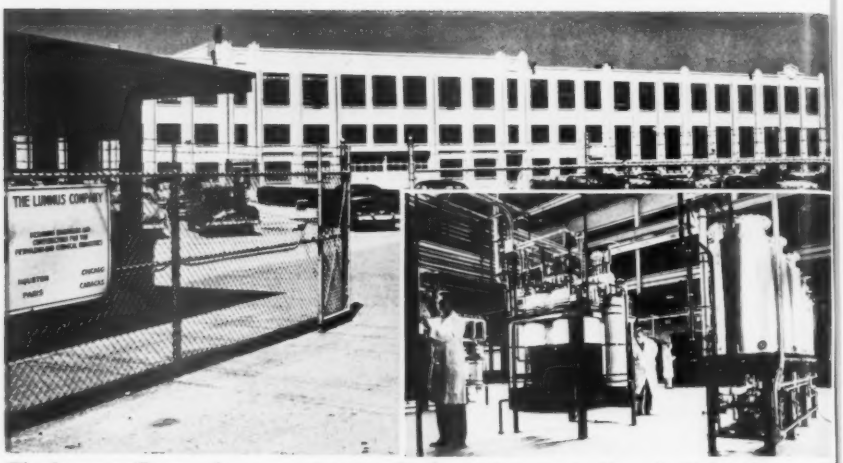
Imports of Petroleum into the United Kingdom

January to June, 1957
(in thousand gallons)

	Crude petroleum	*Motor spirit*	*Kerosine*	*Gas, diesel, and fuel oils*	*Lubricating oil*	*Total*	*Percentage of total*	*January to June 1956*	
								Total	*Percentage*
MIDDLE EAST									
Kuwait	1,772,876	—	—	—	—	1,772,876	37·4	2,042,560	39·8
Iran	162,822	34,686	—	—	—	197,508	4·2	378,566	7·4
Bahrain, Qatar, and Trucial Coast	127,881	8,595	5,511	3,358	—	145,345	3·1	401,351	7·8
Iraq	64,374	—	—	—	—	64,374	1·3	413,455	8·1
Aden	—	50,031	9,563	—	—	59,594	1·2	27,819	0·5
Saudi Arabia	15,103	—	—	—	—	15,103	0·3	53,384	1·0
	2,143,056	93,312	15,074	3,358	—	2,254,800	47·5	3,317,135	64·6
CARIBBEAN & SOUTH AMERICA									
Venezuela	597,116	—	38,646	72,632	6,025	714,419	15·1	448,805	8·7
Netherlands Antilles ...	65,280	31,015	60,350	50,897	14,021	221,563	4·7	383,136	7·5
Trinidad	16,510	64,954	28,334	86,410	—	196,208	4·1	213,276	4·2
Colombia	52,208	—	—	—	—	52,208	1·1	12,082	0·2
Peru	15,135	—	—	—	—	15,135	0·3	22,211	0·4
	746,249	95,969	127,330	209,939	20,046	1,199,533	25·3	1,079,510	21·0
UNITED STATES	475,920	90,082	21,438	302,874	25,712	916,026	19·3	155,330	3·2
EUROPE									
Netherlands	25,945	23,352	41,371	99,033	5,099	194,800	4·1	332,531	6·5
France	—	6,033	1,830	8,611	728	17,202	0·4	66,158	1·3
Italy	—	3,885	—	3,498	—	7,383	0·2	39,914	0·7
Soviet Union	—	—	—	—	2,874	2,874	—	2,028	—
Western Germany	—	—	—	33	—	33	—	2,934	0·1
	25,945	33,270	43,201	111,175	8,701	222,292	4·7	443,565	8·6
FAR EAST									
Sarawak	—	—	—	—	—	—	—	72,695	1·4
OTHER COUNTRIES									
British Commonwealth ...	—	1,403	116	27,994	203	29,716	0·6	12,933	0·3
Foreign	1	17,805	8,944	44,411	100	71,261	1·5	38,417	0·7
	1	19,208	9,060	72,405	303	100,977	2·1	51,350	1·0
GRAND TOTAL	3,391,171[a]	331,841	216,103	699,751[b]	54 762	4,740,533[d]	100·0	5,136,594[e]	100·0
PERCENTAGE OF TOTAL	71·5	7·0	4·6	14·7	1·2	100·0	—	—	—
GRAND TOTAL, Jan.-June 1956	3,808,936	299,676	206,092	743,779[c]	61,102	5,136,594[e]	—	—	—
Percentage of total	74·2	5·8	4·0	14·5	1·2	100·0	—	—	—

[a] Of this total 123,868,000 gallons was refinery feed.
[b] Made up of gas oil, 289,797,000 gallons; diesel oil, 35,452,000 gallons; fuel oil, 374,502,000 gallons.
[c] Made up of gas oil, 278,914,000 gallons; diesel oil, 29,710,000 gallons; fuel oil 435,155,000 gallons.
[d] Including 46,905,000 gallons "other spirit" not included elsewhere.
[e] Including 17,009,000 gallons "other spirit" not included elsewhere.

New Lummus Facilities



The Lummus Company's new engineering development centre in Newark, N.J., where more than 150,000 sq. ft. of floor area are now available for pilot plant investigations, and (inset) *one of the "building blocks." Units such as these permit accurate analysis and projections of chemical process yields based on all sizes of samples—from 1 cc to a tank-car load.*

New engineering-development facilities, to bridge the gap from laboratory bench to full-scale plants for the chemical and petroleum industries, were announced recently by The Lummus Company.

"The trend is towards larger, more complex production facilities for these industries," according to J. F. Thornton, Lummus president. Continuing, he said: "With the facilities of our new Engineering Development Centre in Newark, it is entirely possible on many jobs to project actual productive yields to within 0·01 per cent."

"The need is great", he said, "not only to prove new processes, but also to be able to project accurately the expected yield once a new facility goes 'on stream.' We leave basic chemical research to our customers; our concern is with the translation of research results to productive reality."

The new, 150,000-sq. ft. Centre greatly extends the services offered by Lummus for almost three decades at its engineering laboratory in Bayonne, N.J.

Lummus "Building Blocks"

Unit processes and operations are the "building blocks" in chemical and petroleum plant design. Schematically, almost any new job can be considered as a series of relatively simple units. This approach permits concentration on one part of the job at a time. It also permits translation of previous experience and technology on many of the same types of building blocks.

Typical unit operations, integral in all the complex plants built to-day, include heating and cooling, distillation, fractionation, contacting, filtration, and solvent extraction. Unit processes include oxidation, reduction, catalytic cracking, esterification, hydrogenation, and polymerization.

These same schematic building blocks are used, with only slight variations, in all process industries. They may even have different names when used to produce different end products.

Mr Thornton believed that Lummus personnel staffing the new Engineering Development Centre offered a wealth of data and previous experience on these basic unit operations. In many cases, he said, the Centre would already have units set up to verify engineering data for a new facility on pilot scale plant. But, if not, the Company could engineer and build them at the Centre immediately.

HD OILS

The following additional oils have been approved by the Director of Chemical Inspection, Ministry of Supply, as complying with the requirements of Defence Specification DEF-2101-A.

Supplier and Supplier's Nomenclature	*OMD Grade of Oil*
B.P. Trading Ltd	
BP 2326	110
Mineralölwerke	
MAC HD 20	60
Société des Pétroles Shell-Berre	
Shell Oil S. 5070	110
AB Nynäs-Petroleum	
Nynäs 13 HD-30	110
Germ Lubricants Ltd	
Germil 303A	110
C. C. Wakefield & Co. Ltd, Sydney	
Deusol CR. 30	110
C. C. Wakefield & Co. Ltd	
Wakefield HL. 181/56	110
Sternol Ltd	
Auto-Deso H.D. 20/20W	60
Liberty Oils Ltd	
Omegal H.D. 10W	40
Liberoyle H.D. 20	60
Liberoyle H.D. 30	110
British Oil and Turpentine Co. Ltd	
Velvus D.D. 30	110
J. O. Buchanan & Co. Ltd	
Etergo E. 30	110
Etergo E. 10	40
Etergo E. 20	60
Deutsche Shell AG	
Shell Rotella Oil 30	110
Isaac Bentley & Co. Ltd	
Vinoleo 10W H.D.	40
Vinoleo 20/20W H.D.	60
Vinoleo 30 H.D.	110
Vinoleo 50 H.D.	330
Thos. Moscrop & Co. Ltd	
Lion Deomil 2101 S.A.E. 10W	40
Lion Deomil 2101 S.A.E. 20/20W	60
Lion Deomil 2101 S.A.E. 30	110
Lion Deomil 2101 S.A.E. 50	330

Trade Literature, etc.

Thermal Insulation

A wide range of thermal and sound insulation products for engines and ships is being manufactured by Newalls Insulation Co. Ltd., of Washington, Co. Durham. This Company also specializes in insulation materials for pipes.

Contract for Gamma Radiography

Solus-Schall Ltd announce that they have received a contract from Taylor Woodrow (Nigeria) Ltd, to carry out gamma radiography on a 10-inch pipeline from Port Harcourt in Nigeria to Oloibiri, near Guglo, 60 miles away. It is here that the new oil strike has been made, and the line is being constructed for Shell-BP Petroleum Development Company of Nigeria Ltd.

The project is scheduled for completion at the end of January 1958, and an interesting feature of the work is that the two radiographers working with four radioactive isotopes will have to travel through rocky and swampy country using Land Rovers and canoes.

Laing and Ferguson form New Company

John Laing and Son Ltd and The H. K. Ferguson Company of Great Britain Ltd recently announced that the companies are forming a separate association in the name of Laing-Ferguson to provide a complete and comprehensive construction service to the chemical, processing, and manufacturing industries.

The Laing organization is well known both in Britain and in the Commonwealth for its achievements in building and heavy civil engineering work for industry. Notable industrial projects in recent years include extensive construction work for Britain's oil refining and petroleum chemical industries.

The H. K. Ferguson Company of Great Britain is a subsidiary of The H. K. Ferguson Company of America, an organization of worldwide repute for its experience in providing complete process plants, manufacturing plants, and laboratories for a wide range of industries.

The Removal of Bungs

A useful universal bung wrench, manufactured from beryllium and copper, is being marketed by Beryllium and Copper Alloys (Safety Tools) Ltd, 47 Victoria Street, London, S.W.1.

Lubricant Supplier Nominated for Berkeley

The Central Electricity Authority have nominated Wakefield-Dick Industrial Oils Ltd as suppliers of Lubricants to the Berkeley Nuclear Power Station. This Station is scheduled to start-up in 1960.

New Partner for Austin and Crompton Parkinson

Clark Equipment International C.A. has become an equal partner with the Austin Motor Co. Ltd and Crompton Parkinson Ltd in I.T.D. Ltd, a company which has been marketing the Stacatruc fork lift truck and the Electricar platform truck.

A Material Handling Pump

A unit capable of supplying paint, etc, direct from a bulk container to at least six spray guns, over a medium size circulating system, is being marketed by Alfred Bullows & Sons Ltd, Long Street, Walsall, Staffs.

MAPEL Welding Equipment

The range of this equipment has recently been extended by the addition of the latest Fedrex 160-kV X-ray set. The maximum penetration with this set is claimed to be 1½ inch of steel and provides a convenient means for rapidly inspecting welds in pipes and vessels. Further details are available from Metal and Pipeline Endurance Ltd, Artillery Mansions, Victoria Street, London, S.W.1.

Dechema 1956 Annual Report

This 40-page report follows fairly closely the pattern adopted during recent years. The first part gives an impressive picture of the various activities and publications of the Society, which operates for the benefit of its members in the field of scientific literature. The activities of the Max-Buchner-Forschungsstiftung are covered in the second part, and the report concludes with a list of DIN Standard Specifications which have been drafted in collaboration with Dechema.

The report, in German, is available free of charge on request to Dechema Deutsche Gesellschaft für Chemisches Apparatewesen, Frankfurt (Main) 7, Postfach.

Dechema have also published Vol. 29, Nos. 392-410, of Dechema-Monographs. In this series F. H. Garner, O.B.E., contributes one of the leading articles. Price to members of Dechema is DM 33·75 per copy (DM 42·15 to non-members).

Mass Spectrometers

Two special types of mass spectrometer have been designed for the analysis of inorganic solids. These are the MS5 for the determination of isotope ratio using the surface ionization technique, and the MS7 for the analysis of impurities using the spark ionization technique. Details are available on application to Metropolitan-Vickers Electrical Co. Ltd, Trafford Park, Manchester 17.

The Boulton Catalogue

Although this handsome 64-page catalogue is largely concerned with equipment for the pottery industry, some of the apparatus described and illustrated, *e.g.* tanks, vessels, sifters, agitators, mixers, pumps, and blenders, are of interest to the petroleum chemical industry. There is also a section, entitled "Useful Formulae," which includes details of raw materials, conversion factors, fuel oil specifications, characteristics of gaseous fuels, etc. Copies may be obtained from William Boulton Ltd, Providence Engineering Works, Burslem, Stoke-on-Trent.

Insulating Materials

"Thermal Insulation For The Oil Industry" is the title of a new illustrated leaflet issued by The Cape Asbestos Co. Ltd. It gives details of the Company's insulating materials and their application, and of other of the Company's products used in oil refineries. The Company has also issued a 16-page brochure, entitled "Caposite Amosite Asbestos moulded Thermal Insulation Materials."

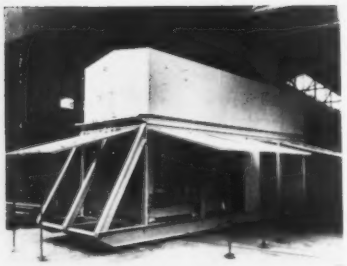
Copies are obtainable from the Company at 114 and 116 Park Street, London, W.1.

New Anglo-American Research and Development Company

A new company, Rheem-Solartron Ltd, has been formed and is jointly owned by The Solartron Electronic Group Ltd, Surrey, and the Rheem Manufacturing Company, New York. It is a research and development company and will work on radar simulation projects and certain other electronic devices, including a multi-headed electronic reading machine for commercial applications.

Petrochem Isoflow Furnaces

The scope of the 1957 Edition has been broadened by the inclusion of data covering over 1650 additional installations. While written primarily for operators of Petrochem-Isoflow furnaces, this profusely illustrated, 116-page manual should also be of benefit to plant designers, operators, and instrument men dealing with any type of heater. Copies of the 1957 Edition may be obtained from Petro-Chem Development Company, Inc., 122 East 42nd Street, New York 17, N.Y.



The "Utility House"

An interesting example of the use of the Leyland industrial engine is its inclusion in a portable generating set which provides up to 375 kVA. Auto Diesels Ltd, of Uxbridge, claim to be the first manufacturers in the U.K. to build these sets, known as "Unitised Utility Houses."

"Titanium for Chemical Plant"

In this brochure it is claimed that titanium and its alloys have characteristics which include outstanding resistance to most forms of chemical attack and good mechanical properties. Plant designed to incorporate these materials is finding increasing use in the petroleum and chemical industries.

Copies are obtainable from Imperial Chemical Industries Ltd, Imperial Chemical House, Millbank, London, S.W.1.

Steel Tubes and Fittings at Helsinki

Stewarts and Lloyds Ltd, with their associated and subsidiary companies, will be exhibiting a wide range of their products at the British Trade Fair, Helsinki, from 6 to 22 September. The display will include samples of screwed and socketed steel tubes and fittings for the conveyance of gas, water, and steam; electrical resistance weld tubes; hot finished and cold drawn steel tubes and test pieces.

Details of these and other products may be obtained on application to the Company, Brook House, Upper Brook Street, London, W.1.

Ancillary Flame-proof Equipment

Evershed and Vignoles Ltd have recently introduced a range of float-operated level alarm switches, including a high-level alarm type (PV.74) which is claimed to be flameproof to BSS.229 for Group II gases, and is designed for non-pressurized storage tanks. Another type (ERS.55) is claimed to be suitable for working pressures of up to 500 psi and to be similarly flameproof for Group II gases.

The Company also manufactures a relay (type LR.134), the switching capacity being 440 volts at 5 amperes. The Company's address is Acton Lane Works, Chiswick, London, W.4.

Taylor-Short and Mason

Taylor-Short and Mason Ltd have announced that in the recent reorganization of their business, a new subsidiary company has been formed which revives the original name Short and Mason Ltd and this will handle the scientific and meteorological instrument business.

To avoid any confusion in the future, the name of the main company has been changed from Taylor-Short and Mason Ltd to Taylor Controls Ltd and this company will continue to handle all industrial instrument and control business, which is associated with the American design of instruments manufactured by Taylor Instrument Companies, Rochester, N.Y., under the trade mark "Taylor".

The addresses of the new companies are as follows:

Short and Mason Ltd,	Taylor Controls Ltd,
Aneroid Works,	Forest Works,
280 Wood Street,	75 Hale End Road,
Walthamstow,	Walthamstow,
London, E.17.	London, E.17.

Africargo Service via Frankfurt

Hunting-Clan's Africargo all-freight services to East and Central Africa are now calling at Frankfurt. This bringing of West Germany into the Africargo flight schedules shows the increasing importance of trade between West Germany and Africa—West Germany is the second highest trader with East Africa, having bought last year over £15 million worth of goods and exported over £8 million worth. Trade with the Rhodesias and the Sudan is also rapidly expanding.

Hunting-Clan's general sales agents in West Germany are Seaboard and Western Airlines Inc. The inclusion of Frankfurt on the frieght services means that cargo can also be carried by Hunting-Clan between the U.K. and West Germany.

Forthcoming Meetings

THE INSTITUTE

(At 26 Portland Place, London, W.1, 5.30 p.m.—tea 5 p.m.)

Modern Trends in Petroleum Analysis. H. Powell, B.Sc., Ph.D., F.Inst.Pet., and W. H. Thomas, F.Inst.Pet.

New Trends in the Instrumentation of Refinery Processes. S. W. J. Wallis, M.Inst.Pet. and D. S. Townend, B.Sc., A.F.Inst.Pet.
2 October

IP ESSEX BRANCH

(At the Railway Hotel, Pitsea, 7.30 p.m.)

Lighterage on the Thames. S. Parr, A.C.I.S.

Film: *Thames Tideway.* **27 September**

Problems Involved in the Design of Hydrodesulphurization Processes. J. J. Darley, B.Sc. **11 October**

IP LONDON BRANCH

(At 26 Portland Place, London, W.1, 6 p.m.—tea 5.30 p.m.)

Life in the Middle East. E. A. V. de Candole, C.B.E., C.M.G., M.A., F.R.G.S. **23 September**

Social Evening—Theatre/Dinner. **4 October**

IP NORTHERN BRANCH

(At the Engineers' Club, Albert Square, Manchester 2, 6.30 p.m.)

Operation Pluto. A. C. Hartley, C.B.E., F.C.G.I., B.Sc.(Eng.), F.Inst.Pet. **15 October**

IP SOUTH-EASTERN BRANCH

(At King's Head Hotel, Rochester, 7.45 p.m.)

Weld Examination. C. C. Bates, M.Inst.W., M.S.E.

Films: *Lubrication in Industry* and *Black Top.* **1 October**

IP SOUTH WALES BRANCH

Visit to N.C.B. Research Station, Stoke Orchard, Cheltenham. **19 September**

(At Training Centre, BP Refinery (Llandarcy) Ltd, 5.30 p.m.)

Operation Pluto. A. C. Hartley, C.B.E., F.C.G.I., B.Sc.(Eng.), F.Inst.Pet. **10 October**

★ ★ ★

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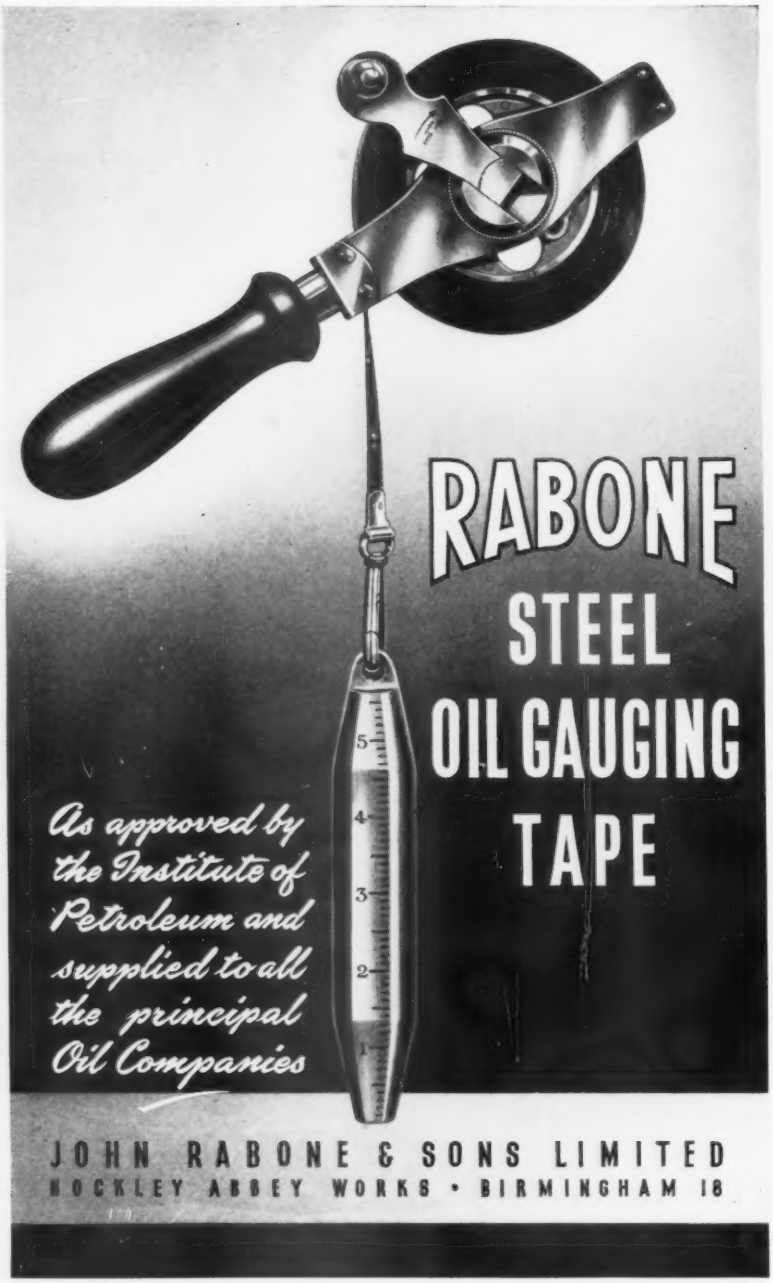
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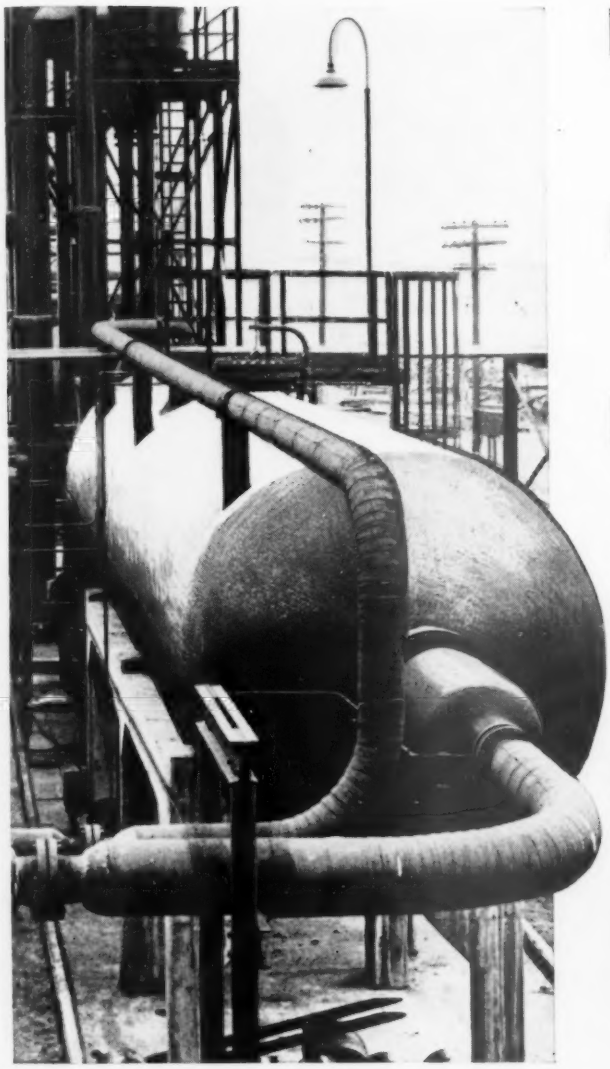

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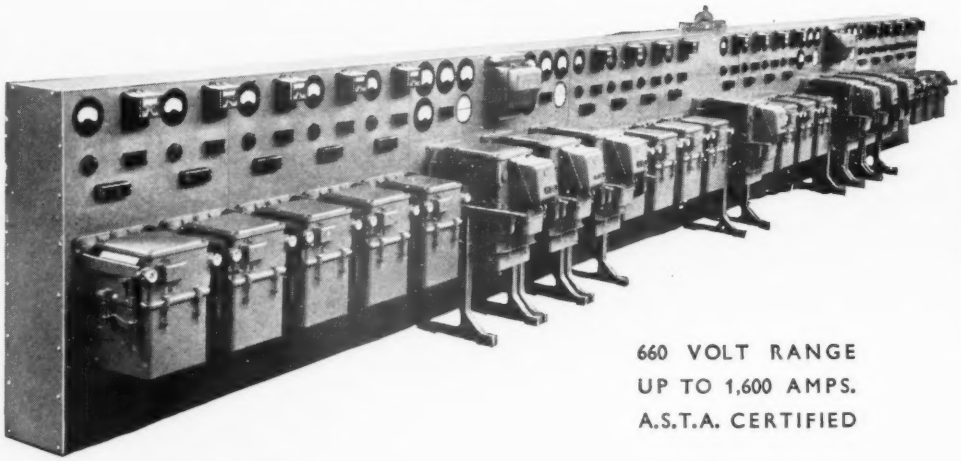

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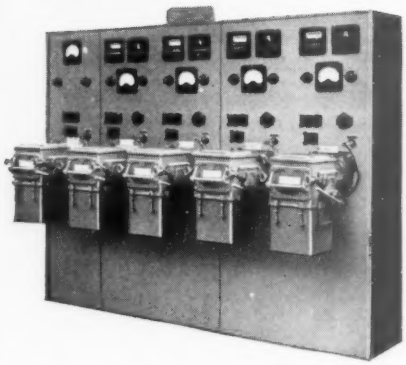

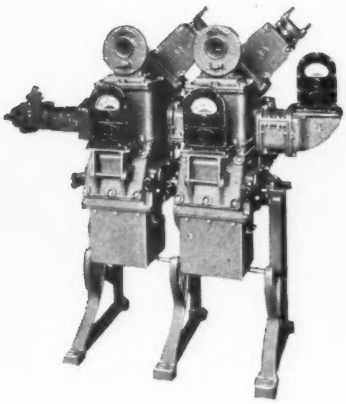

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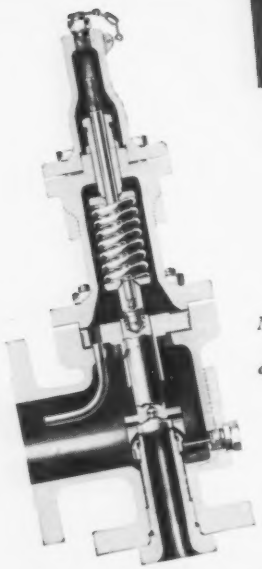

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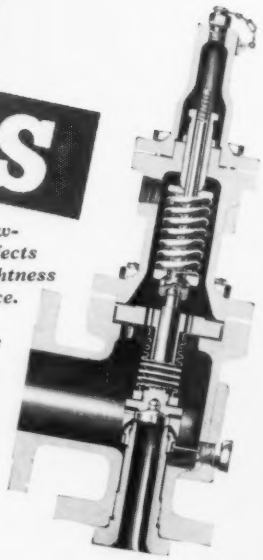

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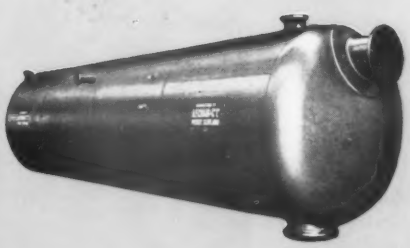

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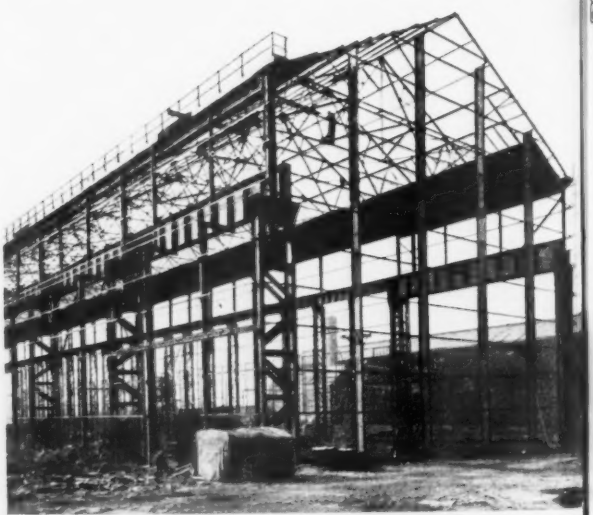

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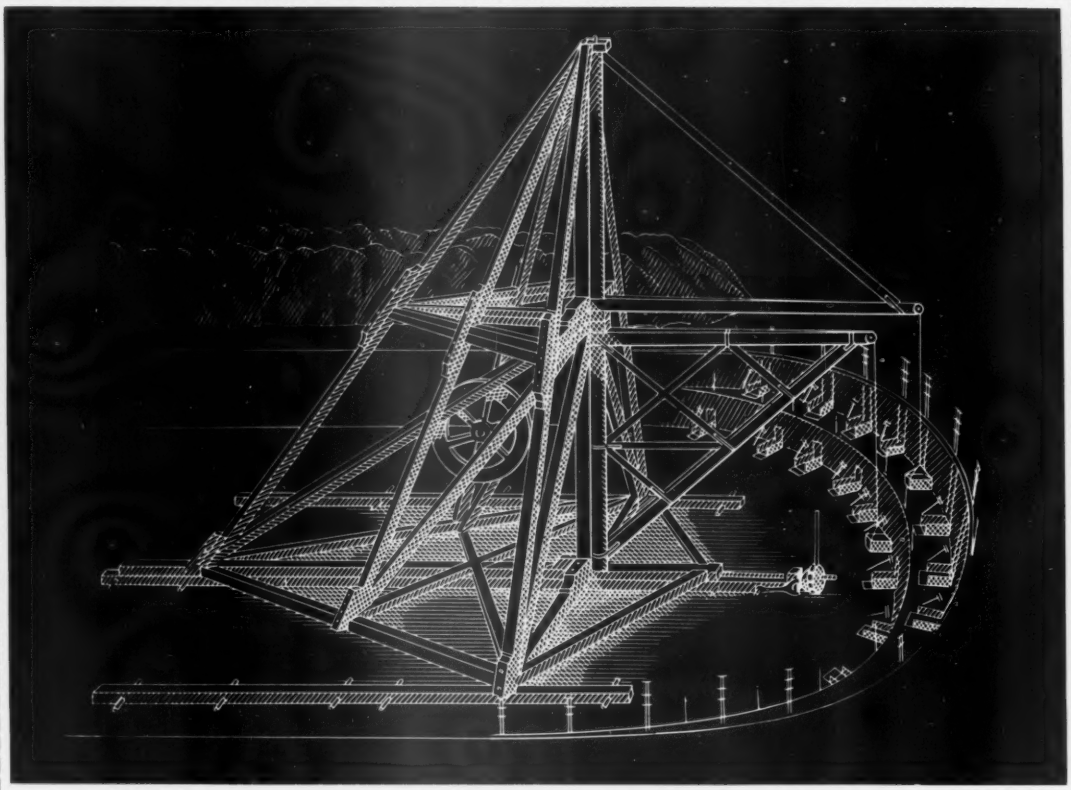

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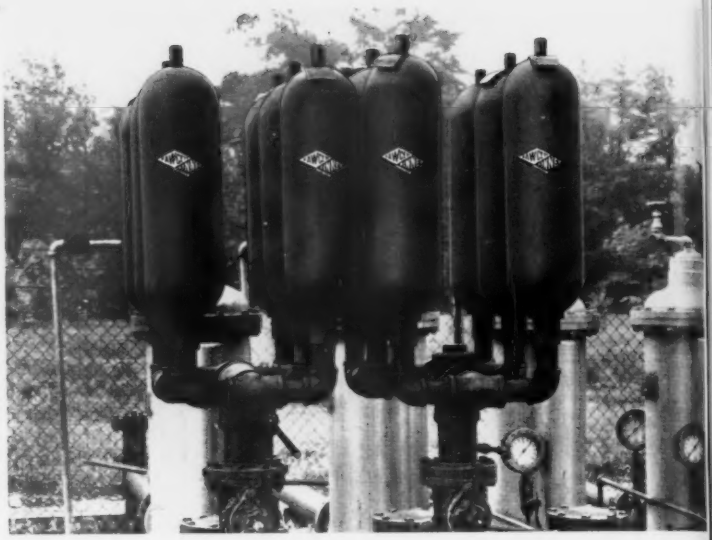

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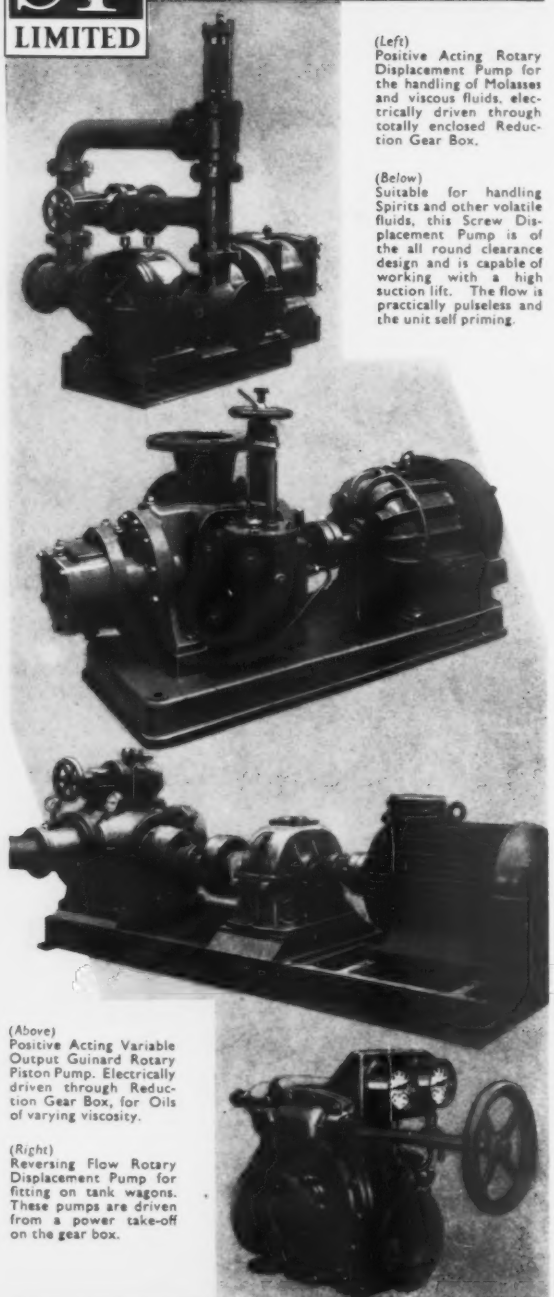

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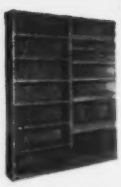

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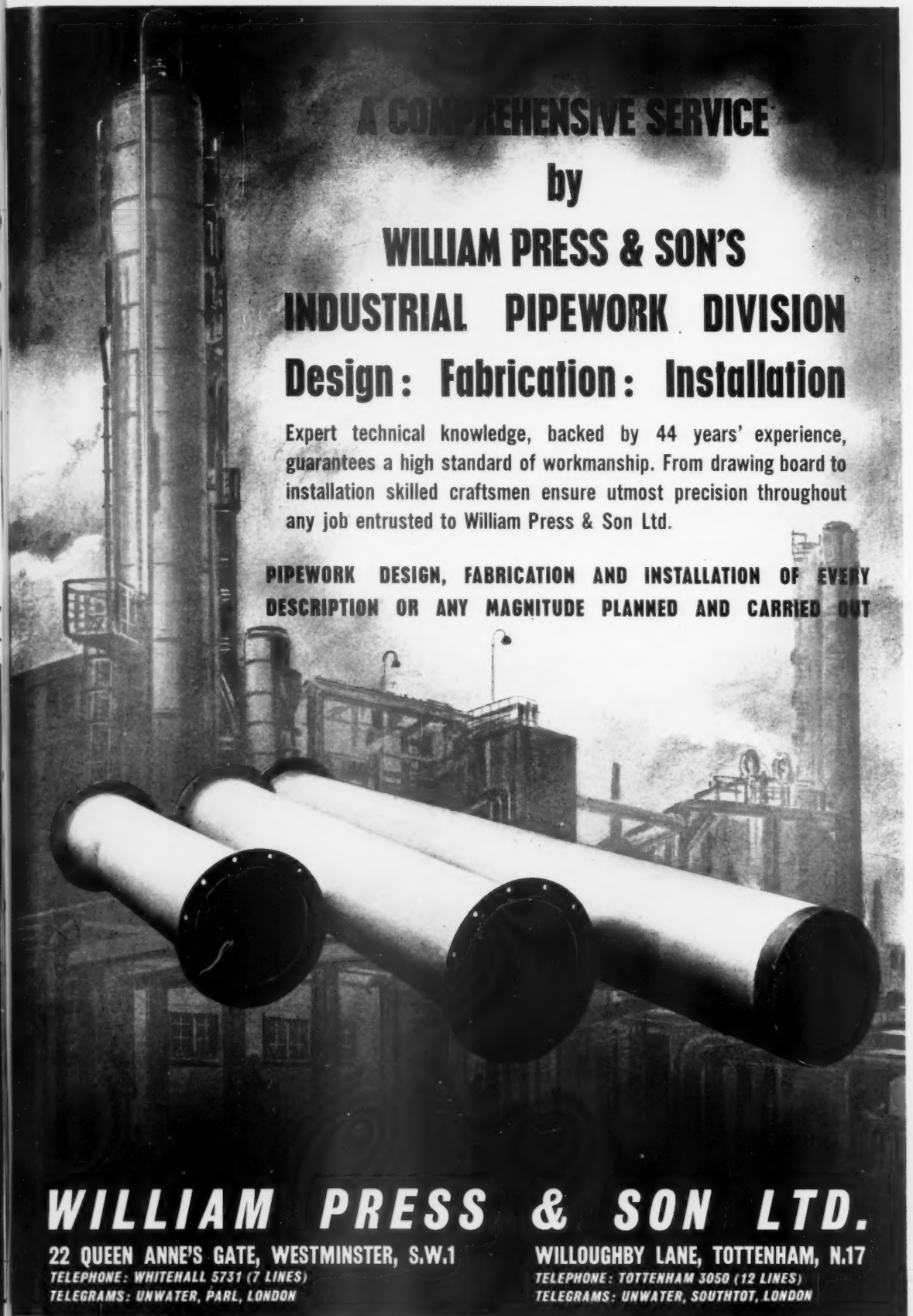
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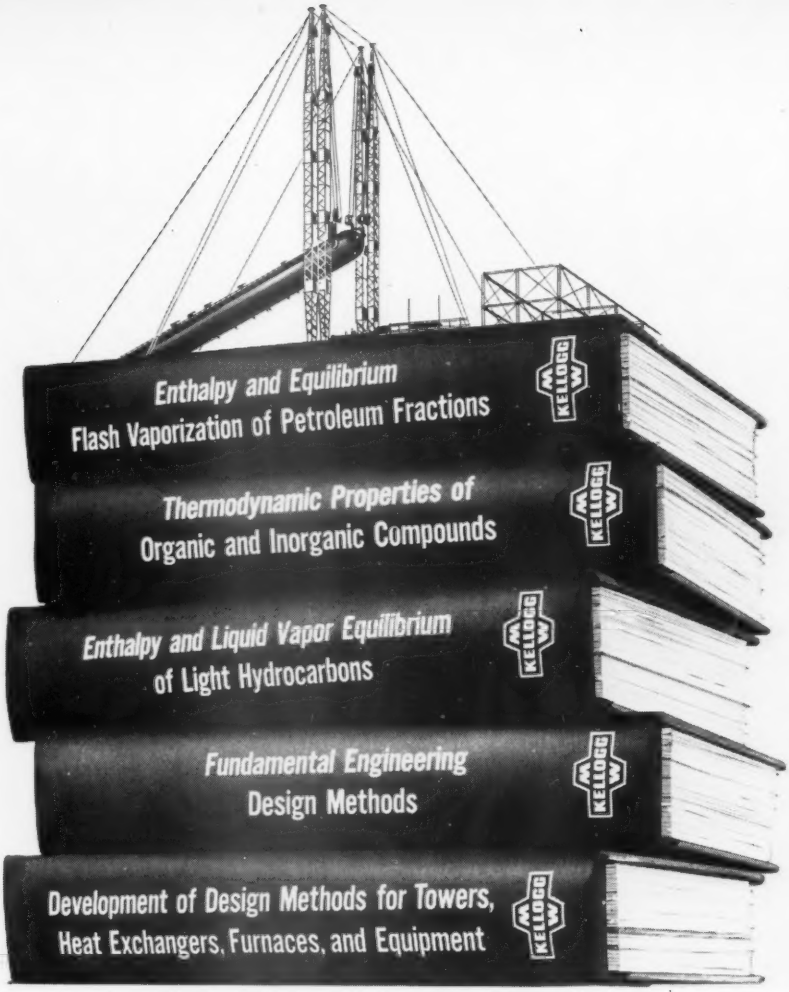

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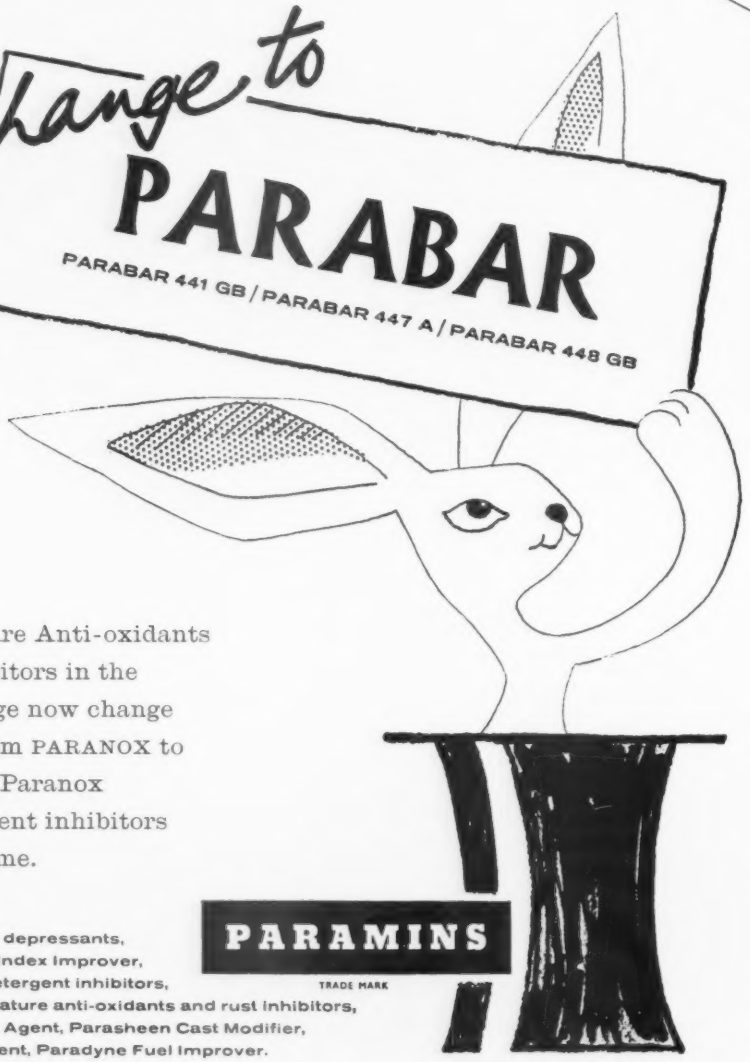

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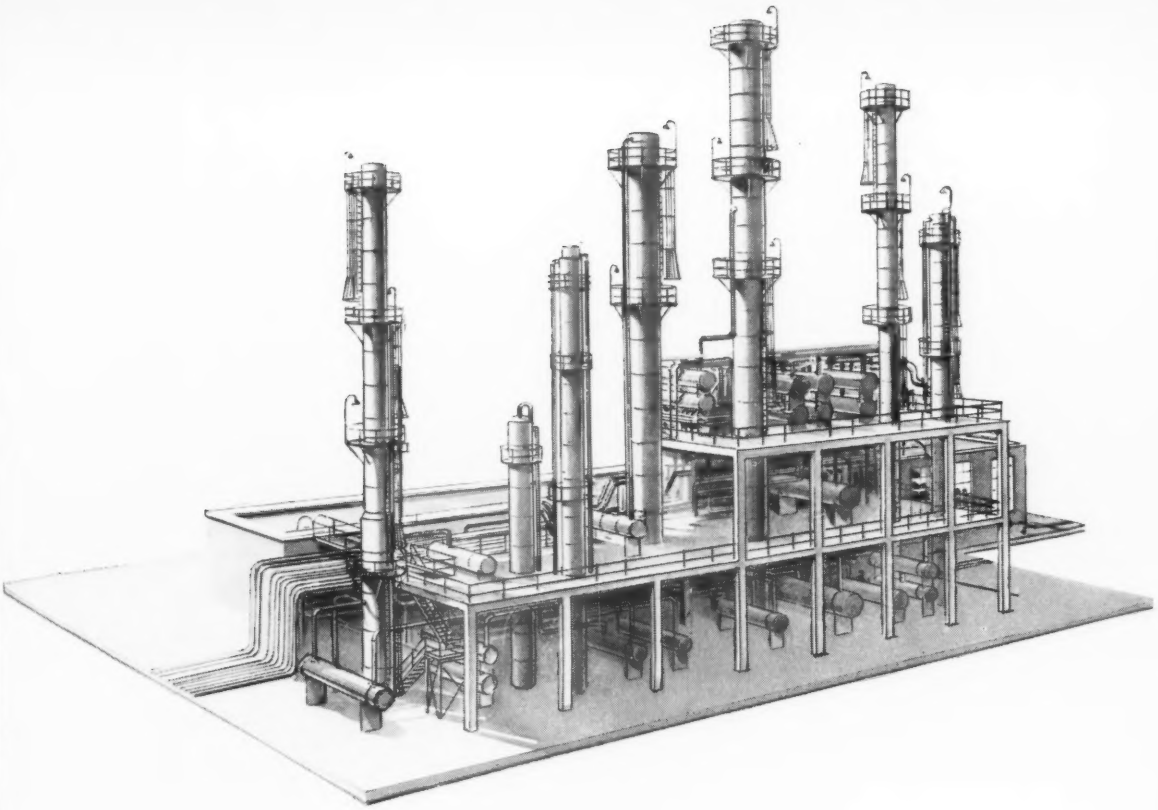

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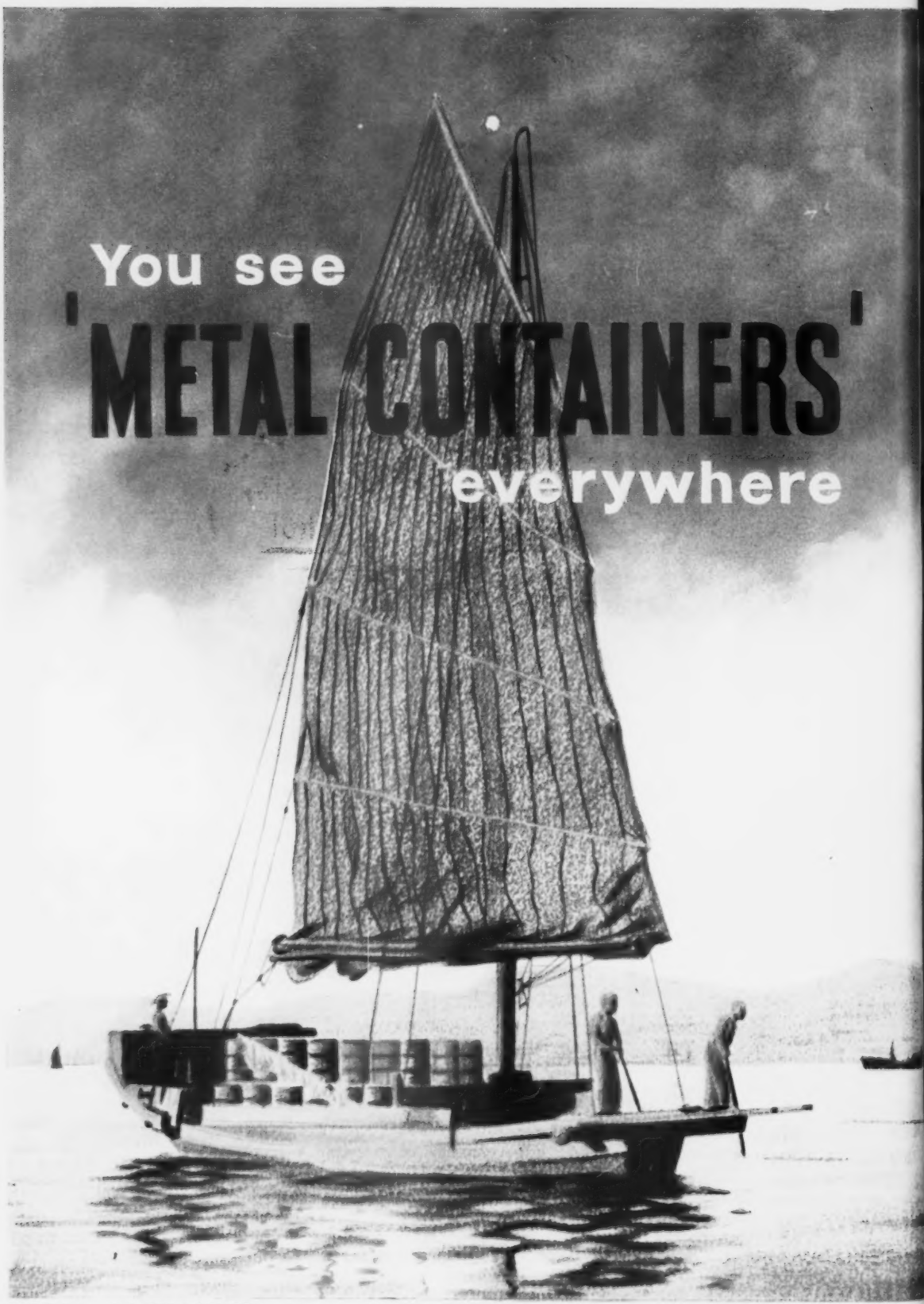

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